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Full List of Contents Page 1

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AUTOMATIC DATA PROCESSING

VOL 2 No 1 CONTENTS JANUARY 1960

Comment: Lightening the Burden of Management 3

When is a Feasibility Study Feasible? 7
Ralph Weindling
◀ The first of a new series on the fundamentals of ADP: the problems involved before deciding on a system analysis.

Mechanisation to the Rescue of the Smaller Firm 9
Erroll Wilmot
◀ The development of cheaper and more compact business computers greatly enlarges the field of automatic methods.

Thirty Million Words a Second 12
◀ A new American device anticipates tomorrow's marvels.

Names and Notes: What is Good for Turitz . . .? 13
Robot
◀ Automatic methods for retail chains.

De La Rue Bull Open Shop 15
◀ The latest entrant to the data processing business announced its first sale on opening day.

Rising Demand for Service Centres 18
American Report
◀ Data processing centres are assuming the rôle of 'public utilities' to serve American business.

The IBM Ramac System 23
Trevor Longman
◀ The third in a series on data processing equipment describes the 'random access' accounting system.

Data Digest: Communications at London Airport 30

Courses, Lectures and Conferences 36

This Easy Money Could Help British Industry 39
Keith Bean
◀ A decimal currency is under discussion: how would it affect machine accounting?

Accessories 43

COVER PICTURE
Drawing by PAPAS

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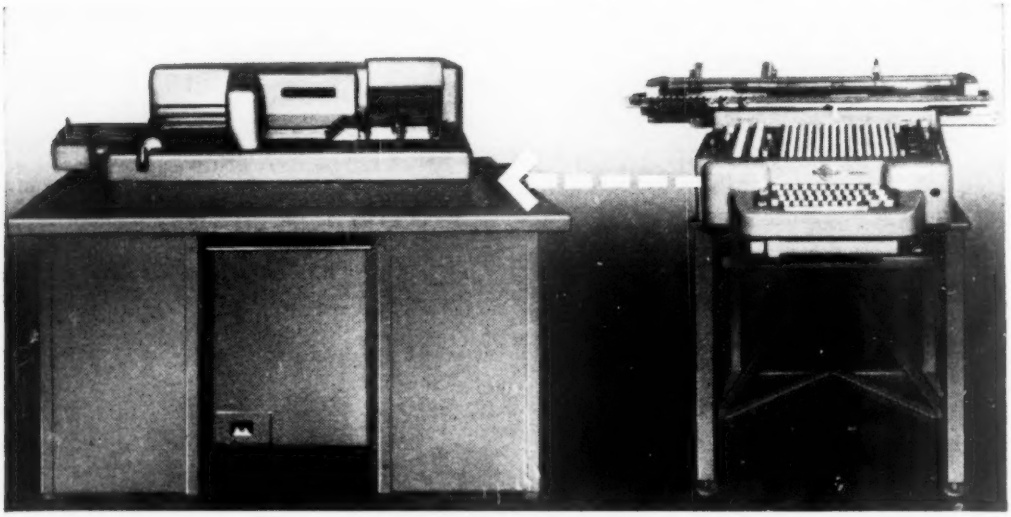

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Comment

Lightening the Burden of Management

UNDER the title, 'Masses and Managers,' *The Times Literary Supplement* recently published a thoughtful and provocative article* in which, among a number of cogent points, the writer criticised some sections of British industrial management for their failure to appreciate what was demanded of them in the industrial conditions of today. The outstanding feature of modern commerce is its employment of increasingly complex machinery and automatic methods of production to satisfy the demands of a 'mass' culture.

'The big changes in society which make it "modern" . . . are due to mass-application of "scientific" discoveries,' he says. But, though business management has created this modern society, there have been failures to keep abreast of the changes, and in particular there has been failure to diagnose the 'disarray' in industrial relationships in Britain, of which workers' strikes are all too frequent symptoms.

The responsibilities of management impose such stresses on managers 'that the traditional British easy-going complacency and cosiness are black marks against any firm or institution manifesting them.' This 'management burden' was the subject of the Elbourne Memorial Lecture that Mr Harold Wilmot delivered to the British Institute of Management in October, in which he said that 'the strain of responsibility under conditions of ever increasing business tempo is a major cause of the dramatic deterioration in executive health in the last half century.'

The problem is a grave one, particularly for Britain, to whom expanding markets for industrial products are vital. The burden of management should and could be lightened; and it can be lightened only in one way—by increasing managerial efficiency.

Here is the crux. The imperative need is, on all counts, for more efficient management. This cannot be achieved simply by the introduction of automatic methods to business administration, but it surely can be achieved by the application of automatic methods in conjunction with enlightened managerial systems and policies. The machines are available: it is up to the managers to evolve the means to use them intelligently. For the prosperity, if not the survival, of Britain as an industrial nation depends upon the quality of her business managers and management techniques.

* In view of the great interest and importance of this article, we have arranged to publish extensive extracts from it in the February issue of AUTOMATIC DATA PROCESSING.

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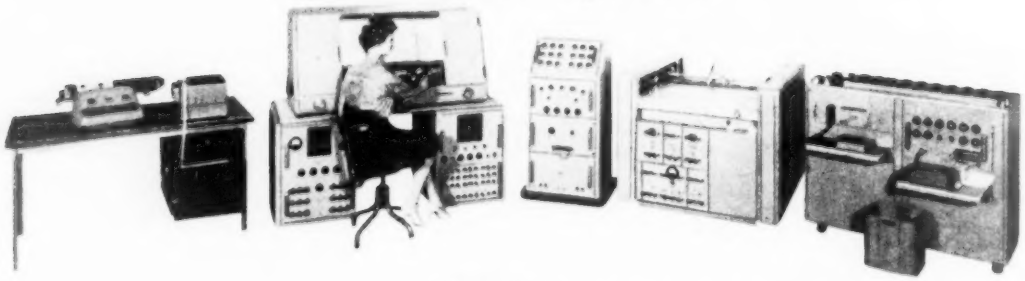

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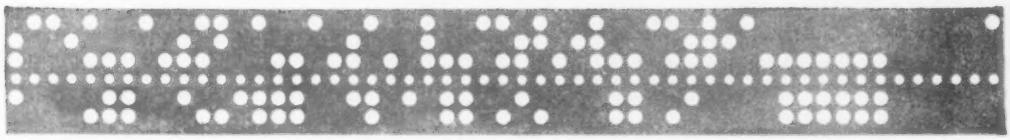

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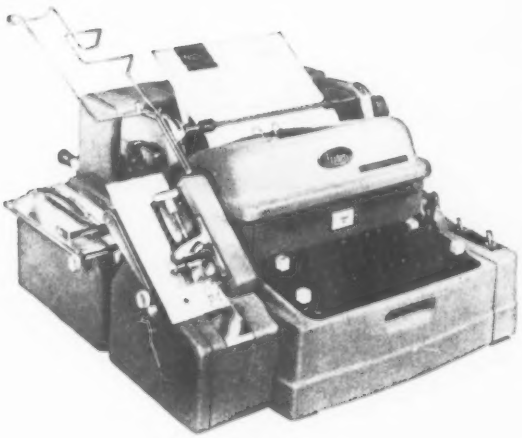

The FLEXOWRITER is an automatic machine which produces a code-punched tape as a by-product of writing the original document. This punched tape is then used to create other records automatically, eliminating the continuous manual reprocessing of data that runs up office costs.

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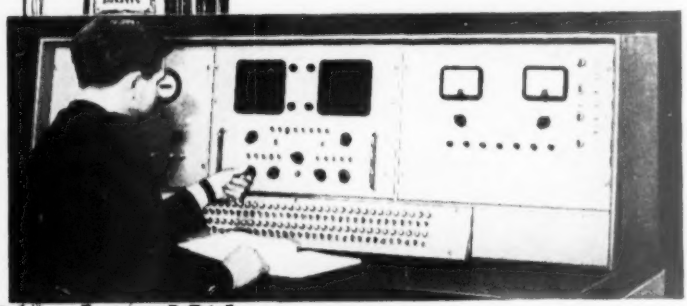
E.M.I. Electronics Ltd. is one of the leading automation organisations in this country. In addition to office computers it manufactures analogue computers, machine tool control systems, process control equipment, closed circuit television and a wide range of other devices.



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The first in a series of articles on the forethought and planning essential before considering whether a computer should be taken on strength explains how a company sets about answering the question:

When is a Feasibility Study Feasible?

Ralph Weindling *Urwick Diebold Limited*

THE aim of this article and of the series that follows is to provide practical tools that can be of direct help in facing the problems and challenge of automatic data processing in your organisation. Each article in the series will present specific suggestions and criteria that experience has proved are generally applicable, and every effort will be made to avoid general principles and concepts, because they are not within the scope of the series. The series itself should provide a step-by-step programme that can be used as a guide in the data processing programme.

THE FIRST STEP

The first step in dealing with automatic data processing is obviously to determine whether automatic methods (used here in the sense of one step above pure punched card and tabulating equipment) can be of benefit in your organisation.

This is an important question that must, in effect, be decided before a so-called feasibility or justification study is undertaken. This rather paradoxical situation arises because a proper feasibility or justification study is fairly expensive. For a large firm it takes from six to nine months' time of several people. For a medium-size or smaller company the effort is shorter, but the cost is relatively as great. In addition, an abortive justification study can lead to internal problems as well—among those who make the study and in the rest of the organisation.

SOME DIFFICULTIES

Some of these possible difficulties are obvious. Building up a team to perform a justification study creates a group that sooner or later identifies itself with an automatic data processing approach. Their bias tends in favour of a computer so that they tend to arrive at an affirmative answer. Equally difficult is the question of re-absorbing those chosen for the study effort in their old positions in those cases where the study result is negative. The effect on the rest of the organisation can also be significant, since many clerical employees are apprehensive of the effect that an automatic data processing system may have on their jobs. The effect is there, at least temporarily, whether the results of the study are positive or negative.

'Failure to do anything can be more expensive than even an abortive justification study'

Failure to act can be more expensive than even an abortive justification study, for it may mean that the company is being deprived of really significant benefits and perhaps exposing itself to competitive disadvantage. These dangers are accentuated by the fact that automatic data processing is a long-term project, with a normal lapse of about three years between initial action and first application. A crash programme to make up lost time is almost impossible.

SOME CRITERIA

How, then, does the responsible executive decide whether or not to launch an automatic data processing activity? The following paragraphs present some rules and criteria, some of them rather arbitrary, that can be of value in making the basic decision. Because it is in the long run much more expensive to do nothing (when one should be doing something) than to consider the question in detail with a negative result, the criteria, to the extent that they are 'wrong,' err on the positive side.

BASIC RULES OF THUMB

1. Any company or organisation with more than 1,000 employees should undertake a serious justification or feasibility study. This statement would *not* hold under the following conditions:

   a. The firm's operations are such that they do not meet the criteria set out below for the company with fewer than 1,000 employees.
   b. The limitations or restrictions mentioned in the last section of this article apply.

   c. The basic requirements that are indicated below are less than half way to being fulfilled.

2. For industrial or commercial firms which physically handle goods or merchandise, a serious feasibility study should be undertaken if a majority of the following conditions apply, or if items (a) and (c) apply.

   a. Present costs for clerical activities (order processing, payroll, production planning and control, inventory control, etc) at any one location exceed £1,500 per month.
   b. The size of the product line is such that present methods do not allow records to be economically kept down to the lowest classification or differentiating factor (colour, packing, size, style, etc).
   c. Better or speedier or more scientific inventory control for finished goods, production parts and in-process inventory would result in inventory reductions, whose 'carrying costs' are worth £12,000 per year. A study to determine this can be made quite independently of a feasibility study. Some of the questions involved are:

      i. What is the annual cost attributable to carrying £1,000 worth of inventory?

      ii. To what extent is the inventory subject to reduction? Limiting factors include decentralised locations each with the need to carry a full line; levels dictated by buying to take advantage of price fluctuations; adequate information on the finished goods inventory existing at the present time.

      iii. To what extent are inventory records dictated by people who would not receive the improved data? For instance, if policy is to produce whatever is requested by the local sales offices, centralised inventory data would be of value only to the extent that trans-shipment is possible and desirable.

   d. Delayed or late deliveries are a serious problem.
   e. Lost items in the production process, excessive use of expediters, unused machine capacity and recurrent crises situations cannot be economically corrected by present methods.
   f. Decentralised operations, over which central control or information would be desirable.

3. For non-industrial companies whose main visible physical output is paperwork (banks, insurance companies, utilities, brokers) the main criterion would be clerical costs in excess of £2,000 per month.

BASIC REQUIREMENTS

A company considering automatic data processing for any type of production planning, production control, or control of stocks must have the following applicable basic requirements:

1. Time standards of reasonable accuracy.
2. Accurate and up-to-date material sheets, indicating the components of each item.
3. Reliable operation sheets, indicating the production steps for each part and product.
4. Adequate reporting of pertinent activity (production, waste, withdrawals, receipts).
5. Consistent numbering or coding systems (parts, operations).
6. Usage records.
7. Machine or works centre capacities.

If those of the above requirements that apply are not at all fulfilled, it would be advisable to start with more basic elements than an automatic data processing feasibility study. However, it is certainly wise to undertake these steps so that the results are compatible with an automatic or mechanised system.

LIMITATIONS

The above rules of thumb are subject to the following limitations:

1. A completely decentralised organisation must make its evaluations in terms of individual units, rather than total size or activity. Headquarters, either as they are at the present time or as they should ideally be, would be one of the units.
2. Clerical personnel who would in any case be required (cashiers, customer service personnel, etc.) cannot be part of the basis of consideration.
3. Legal or 'traditional' restrictions that would prevent changed formats and media negate some of the possibilities.

Mechanisation Comes to the Rescue of the Smaller Firm

The development of smaller and cheaper business computers coincides with ideas to bring down the cost of systems analyses

Erroll Wilmot

IT has been very generally assumed that automatic data processing, particularly in its more complex forms, with computers and magnetic storage, is of interest only to the larger commercial concerns. The value of automatic clerical methods to the smaller firms has been overlooked.

There are good enough reasons for this neglect of the more modest commercial enterprises. Modern data processing equipment has been expensive and bulky. The cost of the equipment alone has been so great that only the bigger and richer companies and groups of companies could afford to buy or rent electronic systems for their own exclusive use; and the other incidental costs, which must include feasibility studies and may include quite extensive modifications to office buildings, can easily exceed the cost of equipment.

There has also been in recent years a significant trend towards the formation and consolidation of large companies and groups of companies, in the belief that the power and resources of these large formations were alone adequate to compete successfully with other firms in the international markets. It has been assumed that this trend will continue and that it will be accelerated, partly by a complex of factors in modern life, including rapid

'Automatic data processing is not a luxury but an imperative necessity for the small firms'

increases in population and the perpetual search for expanding markets, and partly as a direct consequence of the introduction of electronic equipment itself, because the possession of such equipment confers obvious advantages in efficiency and speed of manufacture and marketing.

THE PRESENT TREND

No doubt economists and businessmen are examining these assumptions; and a great many people have expressed misgivings about some of the possible consequences of too great a concentration of economic power in the hands of a few favoured managerial groups, however irreproachable their integrity may be. It is at least debatable whether or not the present trend will continue indefinitely or will reverse itself within the next decade or so. But whatever view one may hold of the way things may go in the future, it is beyond dispute that, here and now, many smaller firms are faced with the necessity to fight for survival against very powerful competition.

NOT A LUXURY

If it is true that automatic data processing confers tremendous advantages upon the big companies and combines, the corollary is equally true: that automatic data processing is not a luxury but an imperative necessity for the small firms. This is not a cause for despair but a motive for energetic efforts to find a solution.

The obvious answer to this need has hitherto been the rental services offered by the data processing centres that most equipment manufacturers are operating. Rentals as low as £15 an hour bring these services within reach of many companies that cannot afford to buy equipment or to accommodate it on hire within their own premises. But there must be many administrative problems that cannot conveniently be solved in this way, and it has been necessary to seek other methods of overcoming the difficulty.

SYSTEMS FOR SMALL FIRMS

There is very little doubt that within a few years fully automatic data processing systems will be available to thousands of smaller companies, including companies employing as few as 25 people.

There are two main ways in which the cost of automatic data processing can be reduced. They are the introduction of cheaper and less bulky machinery and the employment of cheaper and more efficient methods of carrying out systems analyses.

CHEAPER EQUIPMENT AVAILABLE

Most manufacturers of data processing machinery have turned to the development of cheaper, more compact equipment, which has been made possible by the introduction of transistors and other engineering innovations and refinements.

Some time ago the Univac division of Remington Rand introduced the USS 90, a solid state computer which is now available, as the USS 80, in a version adapted for 80-column punched cards. The IBM 1401 transistorised computer, which was described in AUTOMATIC DATA PROCESSING in December, is another machine designed specifically to cater for the needs and resources of smaller businesses.

From America comes the news that we may expect some time in the future to see computers produced by mass-production methods. Indeed, Dr Rex Rice, of IBM, startled the Eastern Joint Computer conference in the United States, early in December, by predicting that the main computer units of the future will be so ' miniaturised ' and so cheap, that the servicing problem will be solved by ' simply throwing the computer away.' He said also that he believed that the development of speech instruction to computers would ultimately have the effect of simplifying equipment and so rendering it cheaper.

But these more radical developments will not occur in the immediate future. Though automatic data processing will grow progressively cheaper, the progress is likely to be, in the words of the United States Supreme Court in another context, ' with all deliberate speed ' rather than startlingly rapid.

AS GOOD AS THE SYSTEM

It may be laid down as a fundamental principle that a computer installation, for all practical purposes, is as good as, and no better than, the business system into which it is introduced.

Though this has been reiterated, in one form or another, during the past year or so, it appears to penetrate all too slowly the inertia of the less progressive managers, who are still, perhaps, enthralled by the charm of 'tradition' in which some business 'systems,' like Topsy have 'just growed.'

UBIQUITOUS COMPUTER

If automatic data processing is really to become as ubiquitous as the telephone—as in time it undoubtedly will—the conduct and techniques of systems analysis must be simplified. The justification for such a statement is perhaps that those firms that fail to avail themselves of the advantages of 'logical' business systems will ultimately go out of business altogether, destroyed by the greater efficiency of the more progressive of their competitors.

SIMPLIFYING ANALYSIS

During the past two years, a large volume of work has been done with the object of reducing the complexity and cost of systems analysis, not only for electronic computer installations but for other, more modest, data processing assemblies, in order to evolve a method that would apply to firms with as few as 25 employees.

Univac, for example, have now developed a method of systems analysis based on the principle of integrated data processing. The nucleus of this method depends upon the logical re-appraisal of administrative needs. It is claimed for it that it greatly simplifies analysis of existing business systems and reduces the amount of documentation in the final report from the massive volumes that have formerly been prepared to about half a dozen pages.

The effort to simplify systems analysis will obviously be pursued by computer manufacturers, to whom costly feasibility studies must appear as a deterrent to potential purchasers of their equipment; and consultancy firms will of necessity follow the same course.

If the 'agony' can really be taken out of systems analysis, as much of the 'mystery' has been taken out of computers, the way will be open for an enormously increased market for electronic data processing equipment.

CARRYING OUT POLICY

There is more than one way of approaching the analysis of a business system. It may be taken as an acceptable dictum, however, that all business consists of selling and producing either goods or services and accounting for these operations.

Systems analysis does not determine managerial policy, but it does show how good policy can be most effectively carried out. The functions with which analysis is primarily concerned are the sales intent and forecasting, the production capacity and intent, and the relationship of each to the other.

'A computer is feasible if it will increase a company's business, not merely if it promises to effect economies in administrative or clerical salaries'

A computer is feasible if it will increase the growth of a company's business, not merely if it promises to effect economies in administrative or clerical salaries.

The essence of a commercial data processing system is the accurate gearing of sales to production (or supply); and an important element in this is the speed with which the variables affecting trade are known. It is obviously preferable to be able to forecast crests and troughs in the pattern of, say, a retail grocery business than to have a history of these fluctuations which can be only approximately valid for, perhaps, the corresponding season a year later.

These conditions of successful trading apply just as much to small businesses as to large: the company that can most speedily and accurately assess the day-by-day fluctuations in customers' demand holds an obvious advantage over its competitors. The company that can most accurately *predict* these fluctuations is in a still stronger position: it is not altogether fanciful to visualise retail chains operating with computers in collaboration with meteorological services in order to predict the daily fluctuations in demand for certain categories of goods. Such services need not be confined to the bigger and richer companies. They can be made available to the smallest of firms, perhaps through co-operative employment of computer service centres, provided that the small firms are prepared to introduce workable and uniform systems of sales analysis and forecasting.

Thirty Million Words a Second

A new American device makes possible transmitting speeds a thousand times faster than in today's fastest computers

TRANSMISSION of information at thirty million words a second is possible in several electronic devices that have been developed by scientists of the Sperry Gyroscope Company in the United States. This momentous news was announced to a recent meeting of the American Institute of Radio Engineers.

These new devices were created for the purpose of developing computers and communications systems capable of sending large amounts of information at speeds at least a thousand times faster than the operating speeds of the largest electronic computers at present in use.

Peter J Isaacs, head of digital computer research at the Sperry Gyroscope Company, said that the earliest use of these new highspeed techniques would be in systems simpler than computers. 'An immediate possibility arising is the development of a special communications system in which a message of, say, 30 words, such as an ordinary telegram, could be transmitted in one-millionth of a second,' he said. 'A system of this kind could transmit the complete message on a single radar pulse.'

USE IN NUCLEAR EXPERIMENTS

Another possibility would be in a data reduction system involving simple operations such as correlating and counting—for example, in scientific experiments in nuclear physics, where thousands of millions of events occur in an extremely short space of time. There is an obvious field for speeds of this magnitude in ballistics and in space research.

The discovery will affect future computer design. 'The new microwave components we have made and operated in the laboratory are capable of performing logical operations and decisions at speeds hitherto unknown in the computer art,' said Mr Isaacs.

He described a microwave diode switch capable of switching 700,000,000 bits of information in a second. The device uses hollow pipes as conductors in place of the conventional wires because it employs 10,000-megacycle alternating energy in place of the standard direct current used in present computers.

MICROWAVE AMPLIFIER

Another component described by Mr Isaacs is a new microwave amplifier tube which can perform logic operations at the rate of one thousand million times a second. This device employs a radio wave travelling down an electron beam to cause one microwave signal to control another microwave signal. Logical circuits employing these devices have operated successfully in the Sperry computer laboratory to perform combinations of logic decisions such as 'and,' 'or' and 'not'.

Mr Isaacs said that devices like the microwave amplifier tube were not necessarily limited to the present laboratory experimental rates of a thousand million bits per second, because even now they had the technological experience to build them for speeds five to seven times as great.

Studies of microwave logic techniques have so far concentrated on the development of components rather than on their incorporation into systems. When the new techniques come to be used for computers, presumably only a small fraction of the computer would have to operate at the ultra-high speeds. Techniques for transferring information from microwave to standard circuits have already been developed.

Ultimately, these revolutionary developments will have their effect on the design of computers for general use. Though it is difficult to see the advantages of such speeds in normal business operations, even to the most dynamic go-getters, one result of present research and experiment is bound to be a dramatic reduction in the size of computers in general use.

Information supplied by John Diebold and Associates, New York.

Names and Notes by Robot

What is good for Turitz . . . ?

THE news that the Swedish retailers, Turitz and Co, who own a chain of 52 multiple stores in Sweden, in addition to a number of large department stores, have ordered an Orion data processing system — the latest system developed by Ferranti—has prompted me to examine briefly what interest British retailers have shown in data processing systems.

Lyons, Littlewoods and Burton are the only retail organisations that have computers—and Burton's is a most recent acquisition—while Boots and Sainsbury's have machines on order. And that completes the list.

Further, equipment that has been specifically designed for the retail industry has hardly been snatched up (only two organisations have Kimball ticket installations, and Boots, a television rental organisation and the Leeds Industrial Co-operative Society are the only ones who have ventured to order special cash registers whose tally rolls can be read electronically), though, to be fair, it may still be early days for this type of equipment.

Keeping a watchful eye on sales and stocks is, I think, the crucial control activity that all retailers are concerned with. Certainly, this is a task that can be done on a data processing system quickly and efficiently, and in fact Turitz's equipment will be applied to this work: checking on stocks and showing when they have to be replenished.

Turitz's installation will include an arsenal of conventional equipment such as magnetic tape units and high-speed printers, and also a system of 30 keyboard stations. These will be installed in the company's central buying department at Gothenburg, and will afford buyers the facility to 'interrogate' the system and obtain immediately information on stock levels in all the 52 multiple stores.

This interrogating facility—it is envisaged that the keyboards might be employed continuously, even if the computing system were engaged on other data processing runs—is possible because of the Orion system's time-sharing features, which enable it to switch from one type of work to another as required.

The notion of using a computer as a bank of information which can be drawn on at will merely by depressing keys is not new. The German retail firm, Quelle—the largest mail order company in the world—has been using for some time a special data processing system which, in fact, goes one step further.

Orders for goods are entered on keyboard machines and this procedure discovers by referring to the system's 'stocks-in-hand files' whether the goods are available and if they are, automatically produces an invoice, complete with quantity, price and total owing.

Similar keyboard systems—usually involving transmitting information over landlines—have been developed for some North American airlines, and in Britain, Shell-Mex and BP are currently engaged in evolving a push-button order-handling office of similar conception.

Giant Computer for One Task

THE Ministry of Pensions and National Insurance have opted to buy an Emidec 2400 which will be installed at the Ministry's establishment in Newcastle. It will be used to deal with the huge volume of data that the new Graduated Pensions Scheme will entail.

In the computer will be stored essential information about the insured persons (of whom there will be some 25 million) such as name, address, amount of each contribution and the sum paid to date. *Daily*, the records of every insured man and woman in Britain will be processed in order to extract details about persons reaching retirement age, or to make changes to the records. It has been reckoned that the daily run will be completed in four hours.

This installation, which will cost the Ministry over half a million pounds, will include 17 fast start-stop magnetic tape decks, and also five magnetic tape units featuring a broad four-inch tape, which will be used as a 'deep store.' A printer, capable of producing 3,000 lines a minute, will also be used.

This is the second order that EMI have received for their Emidec 2400 system—they are currently building the first 2400 machine for the Royal Army Ordnance Corps—and, significantly, both orders have come from Government, and both complexes are to be used for massive, though routine, updating procedures.

Record of all the Talents

PUNCHED cards are certainly more and more multi-purpose each year. IBM cards, for example, are used for baseball match tickets in Costa Rica, for meter reading by the Eastern Gas Board, as air and train tickets in Canada, licence application forms in New Zealand, dividend notices in France and personal cheques in US banks.

The personnel records of New York city police are kept on punched cards. On joining, each member of the force is asked to fill in a lengthy questionnaire about himself, and the information, punched onto cards, is available whenever a job calls for specialised knowledge. Some of this knowledge is quite unexpected. For instance, in the police department a total of 58 languages and dialects is spoken, including obscurer languages such as Tonkinese, Bengali and Ruthenian.

Recently policemen with acting experience were required to fill four parts in a training film being made by the Police Academy. The machine came up with just the right combination of men and talent. In another instance, when Her Majesty the Queen went to New York, the department had to locate eight policemen who stood six foot three inches or over to act as the Queen's escorts.

The records of PRU (Personnel Records Unit) show that nearly 2,000 policemen have a university degree. Their hobbies include astronomy, hypnosis, sleight of hand, bacteriology, stock investment and arranging classical music. One detective even amuses himself by picking locks—his own, I hope!

The Bridge

LATE last year the Electronic Forum for Industry (EFFI, when reduced to its initials, though it might yet be called 'Effi') released its first Bulletin and organised a second 'open day' to which representatives from 12 industries (those that are users or potential users of electronic equipment) were invited.

The Forum's aims are to bring together would-be users of electronic equipment and the manufacturers. The EFFI's chairman, MR CLIFFORD METCALFE, told the industry representatives at the second open day that '... electronics demands a partnership between producer and user, which must be more complete than it was when mechanical equipment was the order of the day. This is the bridge that we hope to build through the formation of the Electronic Forum for Industry.'

The 'materials' of the bridge will be future open days when papers will be delivered, the Bulletin, which will appear irregularly, and a committee (at present composed of half a dozen members) which will be available to give advice.

While it does open up yet another avenue for obtaining information, the impact of such a forum, composed as it is of a number of trade associations with divers interests in electronics, can only be slight. At best, it will serve as a re-directing agency, suggesting to people with problems whom they should contact. But it does reveal that companies making a variety of equipment are developing a sense of belonging to an 'electronics industry,' and there is no reason why the endeavours of such a Forum should not blaze the path for a research organisation, comparable to the Production Engineers Research Association or the British Iron and Steel Research Association, to spring up, which, in addition to carrying out a variety of research projects, could provide a first rate information service.

Consultants' Cues

RECENTLY staged before an invited audience of some 250 Edinburgh businessmen was 'The Rainbow Story,' a play written by Mr A M FULLER of Associated Industrial Consultants Ltd.

Written to illustrate how management consultants set about improving clerical work, the play traced the problems of a fictitious company, Rainbow Paints Ltd, which having increased its business in the fulness of time, could only manage to cope with a large amount of clerical work by regular overtime. In addition, records were not up to date and customers complained of delays and mistakes in invoicing and deliveries.

The *dénouement*—a reorganisation and the entry of a modest *deus ex machina* (the introduction of a minimum of additional equipment)—sees the firm coping with present work and even allows for a one-third increase in turnover.

The Rainbow Story was produced by Mr W REID, also of Associated Industrial Consultants, for the Productivity Committee of Edinburgh and South East Scotland.

If this idea catches on, I can visualise a number of consequences: the rise of the industrial actor (like the industrial mathematician) with Equity becoming a real force in the land, and computers as stage furniture (for Act III, of course) with arch acknowledgments in the programme notes: Ralph Redgud's secretary in Act III kindly lent by National Business Tabulators Ltd?

The French Ambassador, M. G Chauvel (right foreground) was shown the range of machines in the De La Rue Bull demonstration room at the new company's opening

De La Rue Bull Open Shop

Opening a data processing centre in Southampton Row, London, last month, De La Rue Bull Machines were able to announce their first sale

SIR Christopher Hinton, Chairman of the Central Electricity Generating Board, opened the computer service centre and showroom of the newly amalgamated Anglo-French company, De La Rue Bull Machines Limited, at their headquarters in Southampton Row, London, on 9 December.

In his address to an audience which included many leading lights of British industry and diplomatic representatives from many countries, he said that he welcomed this practical example of Anglo-French co-operation.

The uncomfortable speed of technological advance since the war had arisen mostly from defence developments and defence expenditure. This feature was in general true of the computer industry. In America, in particular, computer developments were founded on defence, on the development of nuclear weapons, ballistic missiles, etc. Though this had not been equally true of Britain, the basis of much computer development had been defence work in this country also.

HOTHOUSE ATMOSPHERE

Rapid developments had taken place in the hothouse atmosphere where the warmth had been generated by Government money; but in this amalgamation, the development of data processing machines had been largely independent of defence projects, and the company that had recently been formed should therefore have an excellent chance of survival when the hothouse temperature began to fall.

POWER OF COMPUTERS

Computers had put into the hands of businessmen, scientists and engineers, Sir Christopher said,

'I don't think the world of today could exist without computers'

tools of immense power. They could be misused. He hoped that this company would make it part of their business to see that that power was wisely used. He cited as an example of unwisdom the pious hope of many engineers that by feeding into an electronic machine data accurate to not more than one decimal place they could compute data accurate to at least six places of decimals.

THE FRENCH AMBASSADOR

The French Ambassador in London, M. G Chauvel, said that nothing could be more gratifying to him as French Ambassador than to see a practical example of English and French co-operation, particularly between an English company with a French name and a French company with an English name.

The speakers were introduced by the Chairman of De La Rue Bull Machines Limited, Mr A G Norman, who announced that the first sale of the new company had been to the Royal Exchange Assurance Company. The future policy of De La Rue Bull, he said, would be based more on service than on the sale of equipment, in keeping with the policy that the Compagnie des Machines Bull has pursued in France.

AN INTERNATIONAL ORGANISATION

M. P Dreyfus, a representative of the French company, gave some figures indicative of the size of the international organisation. Bull employs about 8,000 people in France and a further 2,000 internationally. Machines built in France have been exported to 25 other countries. The company produced its first electronic computer, the Gamma 3, in 1952, and there were now 700 of these in operation. At the time of its introduction, this was a pioneer machine, using vacuum tubes and germanium diodes. A later machine, the Gamma 3B, had been sold to more than 70 customers, and the newest machine system, the impressively large Gamma 60, with germanium diodes and magnetic core memory, had already been sold to ten customers and the first delivery would take place within a few weeks.

As an indication of the speed and extent of computer development during the past decade, M. Dreyfus pointed out that the first computers were performing at the rate of three or five operations per second; by 1951, the Gamma 3 was performing 1,000 operations per second and now the Gamma 60 was capable of over 100,000 operations per second. Within five or ten years, he said, machines will certainly be about 1,000 times as fast as the present fastest.

WHAT IS THE USE OF SPEED?

Many people asked what was the use of such high speeds. 'I don't think the world of today could exist without computers,' he said. At present, industry and commerce have too many administrative people in proportion to their productive workers; and the handling of cheques, insurance policies and the billions of transfers daily taking place in commerce simply would not be feasible without large, fast computers.

As the machines became more and more complicated internally, they were rapidly becoming less and less complicated externally; and it was now possible for computers to accept plain language instructions. In the case of the De La Rue Bull machines, he remarked, this capacity was of course bi-lingual.

FIRST BRITISH INSTALLATION

The machinery bought by the Royal Exchange Assurance Company—electronic punchers and verifiers, a mechanical punch, an electronic sorter, a reproducing punch, an interpreter, a collator and a Gamma 3 electronic calculator—would be delivered in March and would be used first for dividends distribution, said a spokesman of De La Rue Bull Machines Limited.

Later, the installation would be used for other jobs which both companies—seller and customer—were now looking into. No definite decisions had yet been made, but applications under con-

sideration included the production of first dividend warrants, registers, tax certificates, etc.

WHO WILL USE GAMMA 60?

Questioned about the potential customers for the big and expensive Gamma 60 system, a company spokesman said that uses would be found for it by insurance companies and big industrial concerns. Certain Government departments might also be interested.

French Railways (the Société Nationale de Chemins de Fer Français) have ordered a Gamma 60 system which is to be installed in May. It will be used for personnel files, the administration of social security schemes, including the bi-monthly payments of pensions, payroll, and job-cost accounting. SNCF have some 360,000 employees and a further 400,000 (approximately) pensioners.

By 1961, inventory control of some 300,000 different types of spare parts will be taken onto the computer, controlling stores in about 200 warehouses; and in the following year the tracking of movements of some 300,000 freight cars will be controlled by the Gamma 60.

TELEPHONE BILLS

Other uses of Gamma 60 installations include that proposed by the Belgian Telephone and Telegraph administration, which will be entirely automated by 1961. Each telephone in Belgium has a counter which produces a punched paper tape, recording for each out-of-town call the date of the call, the calling number, the number called, the time at which the call begins and the duration of the conversation, thus making possible a detailed account which the customer can check. Such a system does not exist either in Britain or in France at present and is not likely in the near future.

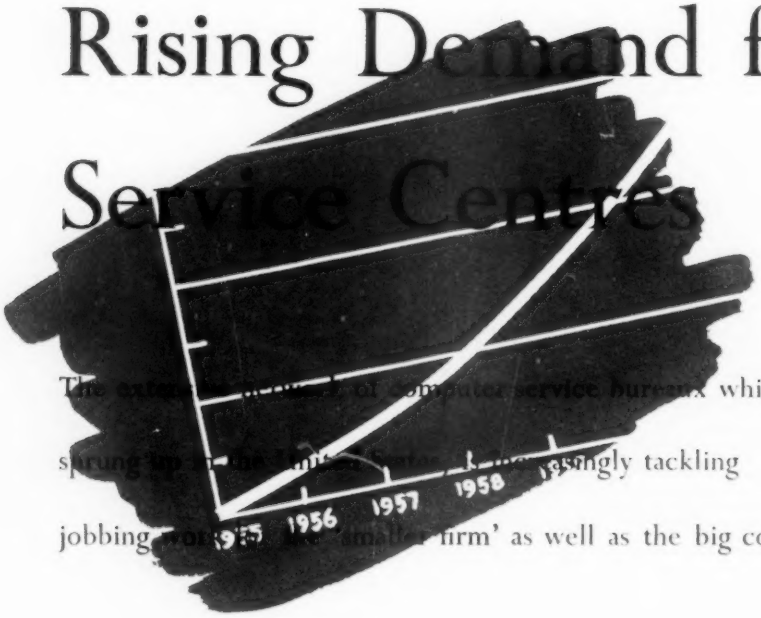
TRAINING COURSES

De La Rue Bull Machines Limited are at present much preoccupied with training adequate numbers of their own staff as technicians and systems analysts, but plans are being made for a training school for customers' staffs in the operation of all Bull machines, from the hand punch to the Gamma 60 computer.

No information is available yet about proposed executive courses.

Notwithstanding the flowers, this demonstration centre in Southampton Row is also to become a service centre, where clients will be able to have data processing work done for them

Rising Demand for Service Centres



The extraordinary growth of computer service bureaux which has sprung up in the United States is increasingly tackling jobbing work for the smaller firm' as well as the big corporation

THE use of computer centre services by both large and small companies is increasing as companies become convinced of the benefits of electronic data processing methods. The large firms, in many cases, are using their own computers to full capacity and therefore hire time at the service bureaux for special problems or for reports which must be prepared at peak periods. More and more companies are planning to install computers and these firms are using time at the service bureaux for training, program debugging and conversion prior to installation of their own computers.

As the use of electronic computers becomes more widespread, the smaller firms are showing increasing interest in automatic data processing methods. Even though the smaller firms cannot justify equipment of their own, use of service bureaux has been proven economical for such continuing applications as payroll, sales analysis, and inventory control, and particularly beneficial for special problems in the operations research category involving linear programming methods.

One of the largest computer centre networks, the Service Bureau Corporation, a subsidiary of IBM, have reported that the backbone of their business was from small firms, most of whose gross sales are under $50,000. Their customers included insurance agencies, schools, hospitals, union locals, small manufacturers, medical clinics, dairies, banks, mortgage companies, independent telephone companies, and other smaller utilities.

In recent years there has been an increasing demand for systems and programming services in relation to computers. Since 1955, a number of corporations have entered this side of computer services. In many cases they do not have computers for hire, but rather trained personnel for assisting a company in obtaining a more efficient operation on a computer already installed. Contract programming is a large part of their business, and has become increasingly important with the demand for automatic programming systems. These companies are undertaking the job of designing and writing such systems for manufacturers of computing equipment.

MANUFACTURERS' SERVICE BUREAUX

In recent months there has been a series of announcements by the major computer manufacturers about plans for additional service bureau facilities. Remington Rand, IBM and Burroughs have been operating computer centres for a number of years. Remington has some 46 centres at branch offices, two of which have large-scale Univac computing equipment. IBM has operated its computing centres since 1948. These services were set up as a separate corporation in 1957 and the Service Bureau Corporation, as it is now called, operates as an independent subsidiary of the parent company. SBC operates 83 branch offices, all of which have a complete line of punched card machines. Medium-scale computers, IBM 650's, are available at 16 of these offices and the large scale 704's are used in New York, Boston, and Los Angeles. Burroughs operates a computer centre at its offices in California. It expects to open computing centres in Chicago and Washington during the first part of 1960.

PLANS FOR THIS YEAR

Computer manufacturers who are entering the race with their new transistorised models have recognised the need for providing service bureau facilities. Radio Corporation of America, National Cash Register Company and Minneapolis-Honeywell are all planning to open computer centres in the early part of this year. RCA is now operating a 501 system in New Jersey and has just opened its Wall Street centre this month. IBM has announced plans for Datacenters to be located in 25 cities throughout the United States. These will be somewhat different from the usual service bureau. The Datacenters will use 7070 systems, and will only rent time on the machines themselves. There will be no programming, systems design or operating services available other than the usual program library available to all IBM customers. The customer will provide his own operators and programs. These Datacenters will compete with the Service Bureau Corporation to a certain extent, even though they do not provide the extensive services available at SBC.

While the manufacturers' service bureaux offer computing services to anyone, one of the main functions of these installations is to provide services and computer time to customers of that manufacturer. This is true because of the necessity of compatibility between a service bureau machine and the customer's own machine. For instance, most contracts for computers include a specified number of free hours on a computer prior to installation of the customer machine. These hours are used by the customer for training, debugging of programs or conversion of files to the computer media. The manufacturer can use his service bureau to provide this time. In addition to the hours included in the contract, a customer will often desire additional time for preparing for his own computer. This, of course, is available at the service bureau for a fee.

TRIAL RUNS ON BUREAU MACHINES

Not only is the service bureau useful to a manufacturer after the sale of a computer, but it is frequently used for sales demonstrations and test problems in the course of making a computer sale. There are cases where a service bureau has been used for an application over a period of time. After the system has proved itself and is operating smoothly the service bureau customer instals a computer of his own. The customer can then be assured that his application is feasible and operational as soon as he starts paying rental on his own equipment.

RCA's Wall Street centre will be used for this purpose. Two brokerage firms, E F Hutton and Co and Reynolds and Co, are planning to use the computer facility for handling customer records, margin accounts and other paper work. These are large brokerage houses processing from three to five thousand transactions a day. The computer centre will eventually be connected by direct wire to the clients' offices. One of these firms, Reynolds and Co, will be using the computer centre for a year and will later switch over to its own 501 system which is to be installed during 1961. Such an extended test period assures smooth running of the company's own facility.

Another function of the manufacturers' service bureau which relates to sales and customer installations is the guarantee that, in cases of emergency, the customer can shift his work load to the service bureau computer. This may be required because the customer's machine is down for an extended period or because he has a peak load at certain periods and his computer does not have time to handle the additional work.

INDEPENDENT SERVICE BUREAUX

The independent service bureaux do not have the built-in contacts and customers that manufacturers' service bureaux have. They must offer results at rates reasonable to the customer and at the same time must operate a profitable business. There are a number of variations in types of independent service bureaux being operated in the United States at the present time.

Entirely independent service bureaux are in most cases offering punched card tabulating services. They will usually have punched card calculators or small computers for jobs which require more

complicated analyses. In order to provide a low-cost service, these companies will specialise in one application, design a standard program which can handle simple variations of that application and will sell this to small firms at an economic rate. The large volume obtained through many customers makes this possible.

An example of this type of operation is the Payrolls and Tabulating Company located in New York City. This company has standard punched card equipment, and a small punched card calculator. They have designed a payroll application on this equipment which can be used for several of the companies which they service. One of these companies has a 1,000-man payroll, a fairly large operation. It is a construction firm which found it very difficult to prepare accurate payroll records under their working conditions. This service relieved their accounting office of a big problem and also prepares the payroll cheques and records at a lower cost.

PAYROLLS FOR 25 EMPLOYEES

Payrolls and Tabulating has recently installed a Univac Solid-State Computer which will increase its capacity considerably. The company expects to be processing payrolls for companies employing as few as 25 and as many as 1,000 employees. The significant factor in the economics of such an operation is that a standard payroll is designed and the equipment is set up to process a series of payrolls in one run. Only the imprinter changes so that the cheque and journal headings will show the proper company name. This provides the means for very small companies to take advantage of savings available through large volume processing.

It seems that the small independent service bureaux will be specialising in particular areas, such as payrolls, as mentioned above, or insurance calculations, for assisting large companies during peak periods, or survey results analysis, or general accounting functions. Through standardised systems they will be able to provide low-cost service to the small companies and not only increase their own business but also provide benefits to their customers. The customers, in so many cases, cannot afford their own equipment and even cannot afford specialised treatment, including systems design and programming on a large computer, at a service bureau.

'Service Bureau Corporation have reported that the backbone of their business comes from small firms'

LARGE-SCALE SERVICES

At the other end of the scale in independent service bureaux is General Electric Company's Computing Services Center. This centre provides a full range of computing services from total data processing jobs to renting time on hardware only. Computing Services will even design systems, program, and run an installation for a customer. They take on special problems of a highly complex and scientific nature. They complete the job from problem definition to presentation of final results to the customer.

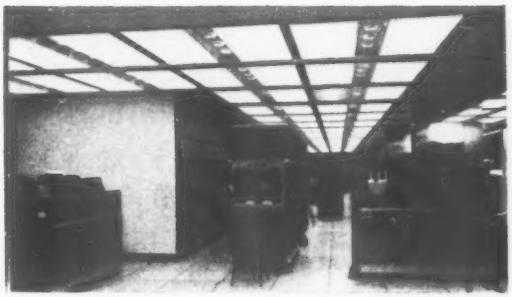
GE's operation is similar in nature to the type of service bureau operated by large consulting firms. Arthur D Little, Inc, engineering consultants, have a computer which they use themselves, but they also offer this service to their clients as an adjunct to their consulting services.

EMPLOYING THE GIANTS

CEIR, Corporation for Economic and Industrial Research, has recently announced a large expansion of its computing services. They will instal IBM 7090's (IBM's most powerful commercial computer now available) in New York, Houston and Washington. In addition, 1960-model computers will be installed in Chicago and Los Angeles. CEIR will provide programming and operating services at its installations.

The high speed machines such as the 7090's are in the three-to-four-million dollar class. Even so, these computers operate at a very low cost per solution, if they are kept busy. Unfortunately, there is a limited number of companies, even large ones, which can, by themselves, keep this type of computer busy enough to recover their cost. CEIR will be able to provide low-cost benefits with a sufficient number of customers to keep the computer busy. Users of these services will, in most cases, be the larger companies.

Computer services are available from other sources than service bureaux. These include companies who have free time on their computers and also colleges and universities who will take on jobs for training purposes or jobs of particular



BRITISH CENTRES

British computer centres, such as the three illustrated, have already contracted to do quite a quantity of service work for a variety of organisations (the activities of a number of centres were reported in a series entitled 'The Computer Centres at Work' in volume one of AUTOMATIC DATA PROCESSING) but much more use could be made of the available facilities by small and medium-sized firms.

On the other hand, computer manufacturers could well make their service centres more attractive by offering additional facilities, such as that of accepting data transmitted over landlines and teleprinting back the results of their processing.

interest in terms of research. Services of this type are often available at lower rates than from the service bureaux. However, because of the variations in the requirements of the computer owners themselves, long term contracts for use of the computer are seldom available.

CO-OPERATIVE SERVICE BUREAUX

While many companies are solving their data processing problems through the use of outside service bureaux, a number of companies have found it more feasible to buy a computer on a co-operative basis with other companies. In most cases, the companies who have banded together have done so because their competitors were able to buy computers of their own. In order to compete, the smaller companies had to have the use of computers and had to have them close enough geographically to perform their daily requirements.

One of the earliest groups of this type is SPAN, a group of fire and casualty insurance companies in Hartford, Connecticut. These companies installed an IBM 705 data processing system in early 1958 for processing their paper work. The large insurance companies were the first industry to instal the large electronic computers for business data processing.

ENGINEERING SYNDICATE

A different type of application for a co-operative service bureau is the engineering computations being performed on a Bendix G-15 computer. This system is operating in southern Illinois as a result of seven engineering firms banding together to form a corporation around the computer, called Midwest Computer Service.* Mr E M Chastain,

* See E M Chastain: 'An Experiment in Co-operation'. AUTOMATIC DATA PROCESSING, Volume 1, Number 3; April 1959; pp 17 to 20.

'Automatic data processing methods have been proven in so many areas that companies are compelled to take advantage of such advances in business methods if they are to keep up with their progressive competitors'

president of the corporation, explains, 'This is our answer to the serious problem of the small engineering group that cannot afford even the lowest cost computer.' He continues: 'But the need for a computer is so great that it's a matter of get one or get out of the race.'

A third group which has seen the need for electronic equipment is a group of banks in Texas. With the advent of magnetic ink character recognition equipment and processing, it is even more important that banks take advantage of automatic equipment. This group of banks will buy equipment and establish a joint computing centre.

Each co-operative group is applying the computer for the same type of application—banking, insurance or engineering. The configuration of the hardware of the system can therefore be designed for the application. The computer operation also has steady customers. These factors make for a more economical operation than service bureaux who are soliciting different kinds of business.

PROGRAMMING SERVICES

There is probably a large number of companies providing programming services for electronic computers. Most of these are very small companies. People who are very competent and have had extensive experience in programming complex applications have found there is a market for their services. In addition, their work can be more interesting because they are servicing more than one company.

System Development Corporation is a very large firm of this type. They employ over 3,300 people, and perform both systems design and programming services. Most of their work is performed for the defence services. They have done a large part of the work on SAGE and also for the Strategic Air Command for the Air Force.

Computer Usage Company, one of the pioneers in the business, has concentrated on the commercial market for computer programmers. Their size is more typical of this type of company. They employ approximately 70 people. Their customers include eight of the major oil companies, and four of the computer manufacturers. Computer Usage prefers to take on a job where the customer has his computer already installed. Their work consists of making the operation really produce, by means of efficient programming and operation. Minneapolis-Honeywell contracted with them to design and program an algebraic compiler system for the Honeywell 800, a large scale transistorised computing system. Another company of this same type, Computer Sciences Corporation, was used by Honeywell for writing the business compiler for the 800 system.

USE OF BUREAUX INCREASING

The use of computer service bureaux is undoubtedly increasing. These centres are now available in every section of the country. Automatic data processing methods have been proven in so many areas that companies are compelled to take advantage of such advancements in business methods if they are to keep up with their progressive competitors. Service bureaux can solve this problem for the companies who do not wish to operate their own data processing centres and also for those companies who cannot economically justify their own computer centre.

Features of the IBM Ramac System

Trevor Longman, *IBM United Kingdom Ltd*

THE simplest and most natural way of processing a document completely is to perform all the necessary operations in logical sequence before starting the next transaction. For instance, the receipt of an order for goods from a customer could initiate the following chain of events. A clerk can examine the customer's account to see whether his credit limit has been exceeded; the stock records of the items required can be checked to see whether the goods can be supplied; the goods can be allocated and the invoice and dispatch notes typed; the clerk can post the appropriate ledgers amending the customer's account and stock records.

When one transaction has been processed completely, the next one can be processed on the same principle. It need not be another order—it might be a note from the warehouse acknowledging receipt of goods, and the clerk would then post the details to the stock record of the item in question and to the supplier's account. The point is that with 'in-line' accounting, as it is called, each transaction in turn is dealt with completely before the next is begun.

As the volume of business increased, such simple clerical methods were no longer found practical. A similar problem was solved to a considerable extent in factories by the technique of mass production. This system gave a single repetitive process to one man, and the item being produced passed through many hands before completion. In the office the same solution was applied to the processing of transactions. Those that required the same treatment came to be batched together so that, whether by clerks or machines, each stage could be handled in volume. Unfortunately, this method of data processing lost the directness of in-line processing. Lengthy sorting and collating operations were often needed; intermediate reports had to be produced, and delays in the accumulation of economic batches often led to further delays in the posting of ledgers. All this meant that up-to-the-minute facts were not always available.

RANDOM ACCESS MEMORIES

In-line accounting on a large scale by machine was not possible until recently, despite the great advance in electronic data processing, because of the lack of a large volume random access memory. A means had to be found whereby the millions of facts and figures relating to a business could be stored economically in a random memory while ensuring that any one of them was immediately accessible. If this could be done, each account affected by a transaction could be adjusted immediately.

A general view of a Ramac system, with the magnetic discs which permit random access to information in evidence behind a window

The high-speed memories that were available—magnetic cores, magnetic drums, delay lines, cathode ray tubes—provided the rapid access required, but they were too small to hold the number of facts needed, and to make them large enough to do so would involve high costs.

Magnetic tape and punched cards, on the other hand, provided the large storage capacities required, but the time required to find a single record at random was relatively large.

MAGNETIC DISC MEMORY

The answer was found in 1955 when the experimental magnetic disc memory was developed. The unit was a stack of 50 magnetic discs which closely resembled a highly engineered automatic record player. The first unit had a capacity for five million digits, and any one of them could be reached in less than a second by means of a reading and writing arm which moved up and down between discs to reach any particular group of data stored as magnetised spots on the disc surfaces. In effect this store contained the equivalent of 50,000 100-column master and balance cards.

Thus the key to continuous in-line accounting was available: the remaining step was to combine the magnetic disc memory with an existing data processing system or to build a new system round it. It was decided to do both. The new system became the random access memory accounting machine known as the IBM 305 Ramac. In addition, IBM added this type of store to its other data processing systems so that disc storage is now available both with the IBM 650 and also with the IBM 7070 data processing systems.

AN INTEGRATED SYSTEM

The 305 Ramac is a balanced system in which input, processing and output times have been matched so that a continuous flow of work between the different units is obtained.

The principal components of the IBM 305 Ramac are:

1. *380 console:* this is the control centre: input to the system is through a punched card

reader incorporated in the console unit which reads up to 125 cards a minute. Additional input can be provided by IBM 382 paper-tape reader. Through a keyboard the operator can momentarily interrupt any job to interrogate the machine's memory for specific stored facts such as an inventory position, customer's balance and earnings-to-date figures. This may happen even though the 305 is, at the time, processing a completely different job. Answers are automatically typed on a typewriter at the console at a speed of 10 characters a second with 100 characters a line. Up to four IBM 381 remote printing stations, which may also incorporate enquiry facilities, may be located as far as 2,500 feet away from the 305 Ramac system. Indicator lights keep the operator informed of the state of processing at all times, and show the results of the machine's self-checking devices.

2. *305 processing unit:* this contains a magnetic drum and magnetic core buffer store, through which information is transferred, and the control circuits for data handling and arithmetic. The drum stores programmed instructions and furnishes temporary storage to rearrange information read from the file. It also contains tracks used for arithmetic and buffers for all input/output units. The magnetic core store holds up to 100 characters and is used as a synchroniser for all transfers of information throughout the machine. Processing speeds are:
   - —transfer between drum tracks—30 ms
   - —transfer from disc to drum track—55 ms (average)
   - —addition/subtraction—30 ms (the machine can carry out 10 additions simultaneously)
   - —multiplication—20 ms + 10 ms for each multiplier digit
   - —division—20 ms + 20 ms for each quotient digit
   - —one drum revolution—10 ms.
3. *370 printer:* this prints up to 80 characters on an eight-inch line. Its speed varies from 30 lines a minute (with 80 characters a line) to 80 lines a minute (with 20 characters a line). Printing may take place at the same time as other programmed operations. The format of reports is determined by control panel wiring and also by a tape controlled carriage similar to that on other accounting machines. This printer may be supplemented or replaced by an ordinary accounting machine in order to increase the speed of the system when large volumes of data have to be printed, especially when little processing is required.
4. *323 card punch:* this card punch, which can punch up to 100 cards a minute, is used only as an output device. Information flows to it directly from one of the tracks of the drum store in the processing unit. Punching may also take place at the same time as other programmed operations. And again, the format of the cards is determined by control panel wiring.
5. *350 disc storage unit:* The IBM 305 Ramac system may contain up to two 350 disc storage units, each of which consists of 50 magnetic discs revolving at 1,200 revolutions a minute. Each storage unit is available in two models holding five or 10 million characters of information, thus giving a capacity of five, 10, 15 or 20 million characters. Each disc contains 100 or 200 tracks comprising 10 sectors and each sector holds 100 characters.

Each disc storage unit normally has one access arm for reading and writing. The time for the arm to move from one track to another on the same disc is 225 milliseconds, and the time for the arm to move from one track to another on a different disc is, on average, 600 milliseconds. These access times may be overlapped by other operations. A second access arm may be added to each disc storage unit, giving additional independent access to the stored records.

DUAL SYSTEM

By means of a dual system control 305 Ramac systems can work simultaneously but independently in conjunction with the same disc file. The primary purpose of this feature is to allow twice the volume of work relating to the filed information to be processed. It also means that two different jobs which require access to the same filed information can be run simultaneously. It becomes possible to handle unusually complex applications which exceed the capacity of a single 305 processing unit while not requiring the extra power and flexibility of a 650 or 7070 Ramac system.

The 305 Ramac system contains comprehensive self-checking features both within the processing unit and also on every input/output device and the system will stop when an error is detected so that the operator can make a correction from the console and proceed. These checks include:

Console Checks

Feed check indicates a card feed failure.

Read check indicates a failure to read a card correctly.

Parity checks monitor all data transfers within the system, character by character.

File check indicates a failure to write a record correctly in disc storage.

Further positive checking features prevent the alteration or eradication of permanently stored data in the file.

Clocking check indicates that the timing control circuits are operating incorrectly.

Printer Output Check indicates that the print unit is incorrectly set up for the character to be printed, or that a parity error has occurred. A special symbol is printed in the left hand margin of any line that fails to pass these checks.

Punch Checks

Feed failure.

Double punch or blank column detection.

Parity error.

Typewriter Checks

Parity error. The 305 automatically underlines any incorrect characters.

CONTROL

The basic control system of the 305 Ramac is a compromise offering the best features of both the conventional control panel and stored program control systems. All information transfers and arithmetical operations are performed *via* a stored program and the instruction format is designed to allow complete freedom in the manipulation of variable field length, alphanumeric data. All logical multichoice decisions are made through selector wiring on the control panel. Process control may be passed at will between the two forms of control.

A TYPICAL APPLICATION

A procedure for invoicing, inventory control and accounts receivable could function as follows:

As orders arrive they are punched into order cards. These contain such information as the customer's account number, the order number and data, and the item numbers and quantities ordered. As many items as possible can be punched into one card, so cutting down key-punching time and card costs.

The cards are verified and then fed in any sequence to the card reader from which the data passes to the magnetic drum under the control of the stored program.

On each order the equipment will do the following operations:

(a) determine the availability of each item ordered; (b) price each item; (c) adjust the stock balance; (d) invoice the customer; (e) perform a credit control test; and (f) prepare the accounts receivable record.

The machine will use the customer number from the card to locate the position on the disc containing this customer's records. The customer's records may contain his name, address and type of business, together with the maximum credit allowed to him and the amount of credit at present outstanding.

The customer's record is transferred from the disc to the drum, and his name and address from the record are combined with the order number and date from the order card on the drum. An invoice heading and number are then printed.

Meanwhile the machine reads the first item number from the order card and finds the record for that item in the memory. The item record could include a description, unit of quantity, unit price, quantity in stock and on order, minimum balance and price.

The quantity in stock is compared with the quantity ordered and, as a result of this test, the computer will invoice the item or note 'back order.'

If the item can be shipped, the customer's order is priced and a further line is printed on the invoice, giving item number, description, quantity, unit price and value. The same information is simultaneously punched into a shipping card from which shipping documents are prepared. The quantity in stock is reduced by the invoiced quantity and the revised stock is compared with the minimum balance for the item. If the new balance is below the minimum balance, a warning card is punched, giving the item description, quantity on hand and on order, back orders and the minimum balance. In any event, the revised item record is then returned to the disc memory.

In the case of a back order, a suitable card, giving item number, description and price, customer number, order number, invoice date and invoice number will be punched.

When the whole order has been processed, the total value is printed on the invoice and added to the amount of credit previously outstanding in the customer's record. The machine determines whether the customer has exceeded the credit limit established for his account. If so, an indication may be automatically printed. This serves as a signal to the credit manager that the order requires approval.

An accounts receivable summary card may also be punched at this stage, giving customer name, credit maximum, previous balance, amount of this invoice, new balance and excess over credit maximum (if any). Up-to-date accounts receivable statements are thus available.

The revised customer record is then returned to the disc memory and the machine repeats the operation for the next customer's order.

ALWAYS UP TO DATE

The ability of the 305 to process transactions in random sequence enables stock receipts, adjust-

Schematic of IBM 305 RAMAC

ments and cash receipts to be posted to the appropriate records in the disc file at any time during the daily invoicing cycle. Thus inventory positions and customers' accounts are maintained in a perpetually current condition.

By the end of 1959 over 600 IBM 305 Ramac systems had been installed, and a large proportion of these are already at work. This figure includes some 20 systems in Europe.

RAMAC APPLICATIONS

Some of the companies in Europe which are already using the 305 Ramac include (Volkswagen (spare parts accounting), Philips (invoicing and stock control), Salamander (production planning), and Aufina. The Aufina Group of Switzerland controls three companies engaged on totally different work in different parts of Switzerland. Applications for the three companies are being performed by a centralised 305 installation.

Typical applications throughout the world include sales analysis, payroll, invoicing, production planning, stores accounting, statistical work and insurance tasks.

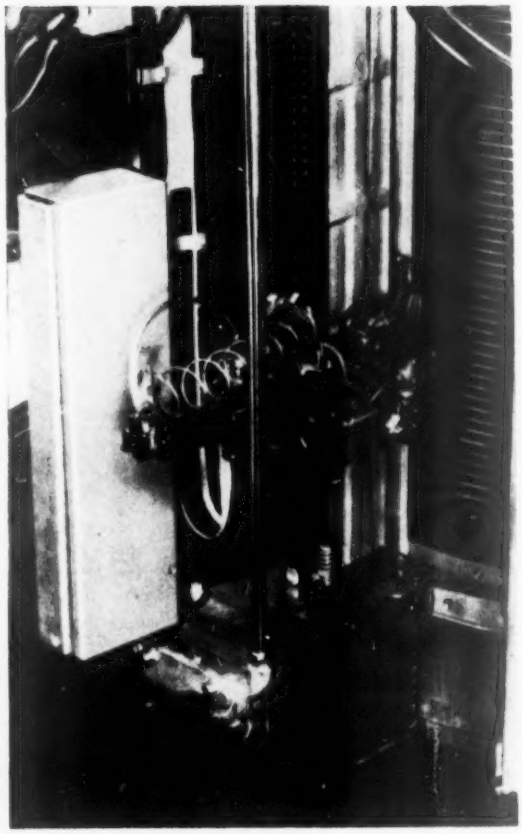
A number of mail order companies have ordered the 305 and it is also being used in Government departments. Ramac was used as an 'electronic history book' at the Brussels Exhibition, and it was also installed at the American Exhibition in Moscow, to answer questions in Russian about the American way of life.

5,000 ORDERS DAILY

Westinghouse Electric Corporation use one of these machines for the daily processing of 5,000 orders for more than 25,000 different renewal parts for all electric appliances. An order can be processed in less than six seconds. This includes up-dating the inventory, preparing the shipping order and packing slip, calculating the price, printing the invoice and supplying information to the accounting department. One of the jobs carried out on this system is inventory control. If the stock of a part is at a low level the 305 checks the quantity in hand and the delivery date of more parts. It then compares this information with the estimated demand for the next 60 days and, if additional parts are needed, the scheduling department is notified.

Maintaining an inventory of 6,700 different types of merchandise, processing customer orders, and the spotting of customer preferences in colours, models and price ranges, are the tasks of the 305 with Montgomery Ward and Co, a big United States mail order and retail chain.

Brown and Bigelow, the world's largest calendar house and direct advertising firm with



A close-up view of the access arm of Ramac reading a track on one of the magnetic discs

customers throughout the world, deals in over 900 items comprising 4,500 different sizes and colours. Using the 305, each business transaction is handled as it occurs and all records are up-dated in the same processing step. Accurate cost control is now possible since complete costs are available as the invoice is printed.

The US Coast Guard Service uses one of the machines to record the movement of all shipping in the North Atlantic and to notify other ships in the area of a vessel in distress.

Ramac is used by the Air Route Traffic Control Centre in Indianapolis. It is the first electronic computer to be used in the control of the congested American airways systems, and is the first link in a network which the American Civil Aeronautics Administration is planning for the modernisation of air traffic control. It is used to compute and print flight programmes data, to estimate flight arrival times over check points, and

to make decisions when there is any conflicting demand for air space in flight plans.

United Airlines use two 305 Ramac's to keep a running inventory of their reservations as they come in over 32,000 miles of leased wires and from 209 sales offices. These machines can process up to 60 million reservations a year. They keep accurate tracks of reserved and available seats in 1,000 flight departures each day. On peak days they handle 50,000 transactions, including reservations, cancellations and waiting lists. Manual operations have been reduced by 68 percent since their installation.

PARTS REPLACEMENT

A speedier replacement parts service on the Boeing 707 and 720 jet transport planes is attained by the company through the use of a Ramac in its transport division. Centralisation of sales, inventory and billing information in the computer permits close control over the company's operations.

The 305 Ramac, which is being built in Germany for the European market, was shown for the first time in Great Britain in November 1958 at the electronic computer exhibition, where it was used for invoicing and stock control. It was again shown at the Business Efficiency Exhibition in May 1959, and this time aspects of production planning were demonstrated. One Ramac ordered at this exhibition was for the Scottish Midland Guarantee Trust Limited of Edinburgh, which plans to use it for hire purchase accounting, the maintenance of dealers' accounts and for statistical information. Other British orders are from medium-sized companies, which have not previously been associated with such data processing machines.

INCREASED PROCESSING SPEED FOR RAMAC

Increased Processing Speed (IPS) is an internal modification of the IBM 305 Ramac system which can be installed *in situ* to provide a significant reduction in processing time for the majority of Ramac applications. It is estimated that the great majority of 305 Ramacs now in use could benefit from the installation of the new Increased Processing Speed feature.

IPS speeds up Ramac operations by reducing the time required to transfer in-process, or 'working,' data between tracks in magnetic drum storage and/or to magnetic core buffer memory where data are accumulated for ultimate use as output information.

Previously, data transfer required three cycles—an *instruction* cycle, a *from* cycle, and a *to* cycle—and three separate drum revolutions in order to effect the transfer. With IPS, a complete drum revolution is not required for each cycle and, depending on the nature of the instruction and the size and position of the data field being transferred, all three cycles may occur during the same drum revolution. Each cycle can begin as soon as the preceding one is completed and a complete transfer can be accomplished in as few as ten milliseconds instead of the normally required thirty milliseconds.

Controlling Crews at London Airport

SIX Creed Teletape transceivers have been installed in British Overseas Airways Corporation's control centre at London Airport. They are designed to transmit facsimiles of handwritten messages and similar data over short distances. These six machines form the hub of a system operated by BOAC at London Airport which at present contains a total of 13 units.

The control centre is responsible for watching the movement of BOAC aircraft throughout the world, co-ordinating information about passenger and freight loads, positioning aircraft for changes in schedules and for the availability of crews. These functions are carried out through liaison with various departments at London Airport, by maintaining telegraphic contact with overseas stations and by direct radio contact over a limited range with the Corporation's aircraft in flight.

CREW ROSTERING

Five of the six transceivers are used for crew rostering. They are linked by simple wire circuits with similar units operated by the crew rostering staff of the various aircraft fleets.

When, for example, Comet rostering have decided on a complete list of the crew to operate a particular Comet service on a specified date, they send the names of the crew by internal post to the crew warning clerks in the control centre. This information is then entered by the clerks on a 'crew warning and acknowledgment' slip, copies of which are posted to each crew member. Frequently, however, further communication on crew matters is necessary between rostering and the control centre. For instance, delay in an inbound service may necessitate the adjustment of an outbound crew, or a replacement may have to be found for a crew member who has fallen ill.

All liaison between the control centre and the rostering offices on any such matters relating to crews at home or abroad is carried out on the Creed machines.

AUTOMATIC TRANSMISSION

Messages to be sent are written in pencil on a strip of 'Teledeltos' paper tape, three-quarters of an inch wide, on a writing platform across the front of the machine, where it is protected by a hinged cover. When the message has been written, the tape cover is closed and transmission takes place automatically, without any further action on the part of the sender. Thirteen inches of tape are available for each message, for which the transmission time is 18 seconds. The messages are recorded on the tape exactly as they are written by the sender, and as reception is automatic it is not necessary for the distant machine to be attended at the time of transmission. The Teletape machine is a combined transmitter and receiver, so that one machine can be used for both sending and receiving messages.

The sixth Teletape machine in the control centre is used for communicating with two other machines, one at Station Operations, the other at Service Control, both on the north side of London Airport. Service Control is responsible for all the aircraft documents that have to be completed before an aircraft can depart, and Station Operations maintain a flight watch on outgoing and incoming aircraft. Between these points there is a constant interchange of information relating to crews operating various flights, aircraft changes and alterations in seating arrangements, re-routing and other important matters.

PERMANENT RECORD

One of the main advantages of this system is that a permanent facsimile record is provided of

all messages sent and received. It eliminates the risk of verbal errors and provides signatures which may be valuable if subsequent investigation of messages should be necessary.

American Airlines Communications System

IBM have developed a completely automatic reservations system for American Airlines in New York. It will be, according to the manufacturers, 'the largest data processing system in the world' and will handle every procedure to do with the sale, confirmation and control of airline reservations, from the first request for information to the arrival of the client at his destination.

The system will be based on two large-scale transistorised computers and will centralise the demands of more than 1,100 booking offices throughout the United States. Seat inventories, maintained in the electronic file of the computer, will enable agents to determine what seats are available on any flight of American Airlines. Automatic teletype messages will also go to other airlines, requesting space on their flights, quote fares, supply information about the day's flights and notify agents when special action is necessary.

Each of the computers in the new system, which is labelled IBM 9090, is capable of 210,000 logical decisions per second. They are expected, in the early stages, to cope with 85,000 telephone calls, 40,000 reservations, 30,000 exchange messages with other lines, 30,000 fare quotations and 20,000 tickets every day. In busy periods, they will have to deal with 7,500 reservations an hour. BOAC have ordered an IBM 650 computer, with punched card equipment, to be delivered next month. The installation will be employed chiefly for revenue accounting and for reservations.

Air France has ordered an IBM 705 and Alitalia has ordered an IBM 7070.

Computer Manufacturers' $500,000,000-Gamble

Can They Stay the Distance?

Francis Bello:
THE WAR OF THE COMPUTERS
Fortune, October 1959, (USA)

THE present sales battle may end in 'the painful exit of some very substantial firms.' Two years ago there were only four firms building large electronic data processing systems in the United States; now there are nine. One firm estimates that it will lose over $130,000,000 on electronic data processing before beginning to make a profit. The whole industry may lose $500,000,000.

'In this exotic electronic business, as in every other, there is no more potent sales force than a satisfied customer, and in the brief, hectic history of the computer, satisfied customers have been none too plentiful.'

The nine heavily committed firms are International Business Machines, Remington Rand, Burroughs, Minneapolis-Honeywell, RCA, Philco, National Cash Register, General Electric and Control Data Corporation.

The computer industry expects the market to grow from $1,500,000,000 now to nearly $8,000,000,000 by 1969. There are probably more orders for big machines now than at any time in the entire eight-year history of the industry. Perhaps more than 500 great computers will be built in the next two years.

'Because the computer business is so complex, and the cost of developing the biggest machines is so high, it seems likely that only three or four firms will be able to hold the pace.'

Computers were heavily oversold up to 1954, and by 1957 some sharp disillusionment had set in. The computer builders are gambling on an enormous but unmeasured demand: 'market research in the computer field is almost worthless.' But the clerical force in American business grew by 58 percent between 1940 and 1950, and by a further 33 percent from 1951 to 1959.

When the Atwood Vacuum Machine Company installed an IBM Ramac system they estimated a 15 percent saving in clerical costs, 'but this would not have justified the installation. The real objective was to solve a special problem: the firm

The party of German industrialists and professional men who visited Britain last November called on EMI Electronics in Hayes, Middlesex, and were shown the Emidec 1100

was unable to work up a detailed production program on the basis of actual orders and still meet delivery dates . . . With Ramac, production and inventories can be scheduled *after* the orders are in-hand.'

Many big management consultancy and auditing firms have set up data processing departments to conduct computer feasibility studies and draw up specifications for their clients.

'There is no substitute for meticulous preparation and programming before the computer arrives. The eighteen months that it usually takes to get delivery on a big machine is a minimum amount of time to prepare properly.'

The writer predicts that 'the time may not be far off when it will seem as uncivilised to run an office without a computer as without a telephone.'

Operational Research

M J Sullivan:
OPERATIONS RESEARCH
Punched Card Data Processing. Volume 1: No. 6 September October 1959 (USA)

OPERATIONS Research began in Britain during the war, when scientific workers were assigned to operational groups of the Imperial General Staff to help to solve tactical and administrative problems. In commerce, similar techniques are employed, with the assistance of automatic data processing machinery, including computers, to solve business problems.

The author lists eight principal techniques: linear programming, queueing theory, Monte Carlo methods, search theory, information theory, game theory, probability theory and sampling theory. These are briefly described:

Linear programming is a mathematical procedure to evaluate combinations of alternative factors having linear interdependence.

Queueing theory is concerned with problems of 'waiting lines.'

The Monte Carlo method simulates random variables from a vast number of alternatives.

Search theory is a technique for rendering optimum results with minimum tools.

Game theory is a technique of strategy on a mathematical model in which two or more participants compete for best results.

Probability theory applies to situations in which the probability of breakdown or other factors can be calculated.

Sampling theory is an estimating technique employing random samples to give data to a predetermined degree of accuracy.

Simplified Programming for Engineers

W R Brittenham, K Clark, G Kuss and H Thompson:
SALE, A SIMPLE ALGEBRAIC LANGUAGE FOR ENGINEERS
Communications of the Association of Computer Manufacturers
October, 1959. Volume 2: No. 10 (USA)

THE authors describe a specialised automatic coding system that they have developed to fulfil the following conditions: (1) it must be easy to learn and use, with a minimum of language complications; (2) it must require the minimum of computer time to convert the problem into machine language; (3) set-up and tear-down time on the computer must be nearly nil; (4) immediate printed results must be available to the user; and (5) the over-all procedure should be efficient for small problems, but not necessarily for large ones, for which it is not intended.

The system is called SALE (Simple Algebraic Language for Engineers) and was written for the IBM 705. The ultimate justification for it is economic, and the authors claim that with it the IBM 705 can be profitably used as a substitute for mental calculations which would entail more than one man-hour of work. The authors are members of the A O Smith Corporation, Milwaukee, Wisconsin, USA.

The German party also visited English Electric. Below, the leader of the party, Dr Carl Boehm, questions Mr J O Trundle (centre) and Dr V E Price of the host company

The first Ferranti Perseus system was installed in the building of Datacentralen, Stockholm, late last year. Datacentralen is jointly operated by two large Swedish insurance companies, Trygg and Fylgia. Above, Mr Sebastian de Ferranti (left), managing director of Ferranti, with Mr Carl Erick Schang, Datacentralen's managing director
(See page 34)

Automatic Drawing Office

THE Marconi Wireless Telegraph Company are automatising their engineering drawing office with a microfilm system based on the Rank-Xerox Copyflo xerographic enlarging machine. The first of the model fives to come off the production line will soon be installed in the company's Chelmsford headquarters. It will be on hire from the suppliers.

Drawings and documents will be microfilmed and each frame of microfilm will be inserted in 'Filmsort' cards, which can be coded and punched for filing.

Copies of the drawings are made by stacking the selected cards in the Copyflo machine, which scans each card and makes the required number of enlargements by automatic xerography.

British Petroleum Company Orders Mercury

THE British Petroleum Company has ordered an automatic data processing system from Ferranti Limited, based on the Mercury computer. The system will be one of the largest and fastest to be installed in Britain and will be used both for scientific computing and for business data processing.

The installation will be completed within the next 12 months.

Germans See British Computers

A PARTY of 22 industrialists and professional men from Western Germany visited eight British computer companies from 30 November to

An optical comparator used by the cheque testing service of the National Cash Register Company of Dayton, Ohio. The service aims to give advice to American banks on printing cheques with magnetic ink

4 December. The visit was organised by the joint committee of the Electronic Engineering Association and the Office Appliance and Business Equipment Trades Association, under the chairmanship of Mr V M Roberts, with the co-operation of the Board of Trade and the British Embassy in Bonn.

The eight firms visited were Ferranti, English Electric, EMI Electronics, Standard Telephones and Cables, International Computers and Tabulators, Associated Electrical Industries, Elliott Brothers, and National Cash Register.

The visitors considered that British computers could compete in the German market both for quality and for price, and they were impressed by the experience gathered and the training facilities offered by British firms.

Brief Items

THE Development and Engineering group of the United Kingdom Atomic Energy Authority has installed an IBM 704 at Risley to be used for calculations on reactor physics and other factors in design.

* * *

THE merger of the Hollerith and Powers-Samas interests has been announced in Australia, where the new combine will be known as International Computers and Tabulators Australia Proprietary Limited. They will employ a staff of about 400 people, including data processing specialists, electronic engineers and administrative personnel.

* * *

A FERRANTI Perseus data processing system was installed in Datacentralen, Stockholm, at the end of October. This is the largest system yet installed anywhere in Scandinavia, and it cost its purchasers, the Trygg and Fylgia insurance companies, over a quarter of a million pounds.

The installation was attended by the scientific attaché of the British Embassy in Stockholm and a large number of Swedish business men.

* * *

MAGNETIC character printing on cheques will be used in the National Cash 304 bank automation system to be installed in Fifth Third Union Trust Company, of Cincinatti, Ohio, which is to be operational in 12 months' time.

The magnetic characters will be printed on the bank's cheques before the automation system is introduced in order to give the system a trial run in.

Anticipating rapid growth in bank automation in the United States, National Cash have set up a free technical service for testing cheques with magnetic-ink characters. (See illustration.)

BOOK REVIEWS

Useful Handbooks

Eugene M Grabbe, Simon Ramo and Dean E Wooldridge (Editors):
HANDBOOK OF AUTOMATION, COMPUTATION AND CONTROL. *Volume 2:* COMPUTERS AND DATA PROCESSING
John Wiley and Sons, New York; Chapman and Hall, London. 140s.

Daniel D McCracken, Harold Weiss and Tsai-Hwa Lee:
PROGRAMMING BUSINESS COMPUTERS
John Wiley and Sons, New York; Chapman and Hall, London. 82s.

IT is a rare pleasure to be able to review two books together and to be able to recommend both as indispensable; but both these books deserve to be so described.

Indispensable to whom? The first should be available to everyone who uses computers, whether for business, scientific, industrial or other purposes. It is the second volume of a three-volume handbook, of which the first was reviewed in AUTOMATIC DATA PROCESSING, Volume 1, Number 5, for June, 1959, and from the point of view of the commercial user it is by far the most important of the three. Its 41 contributors cover the ground, from an explanation of computer terminology through programming, descriptions of data processing equipment and systems, the design of digital and analogue computers, to a consideration of 'unusual computer systems.'

The longish section on programming and coding will be of limited immediate value to the business executive who has not some mathematical training or aptitude, but it will prove its value within the computer department. It starts, admirably, from basic principles, under the section title, 'Nature of Programming,' and proceeds step by step through all stages of the construction of programs, including several sections on automatic programming techniques, and ends with a short subsection on 'Programming with Natural Language,' which is useful mainly for its references to fuller treatments of the subject.

The section of most interest and use to the majority of readers of this journal is that on 'The Use of Digital Computers and Data Processors.' As the writer of the introductory chapter in this section, M J Mendelson, observes, 'business data problems tend to show a strong similarity of structure and generally can be shown to consist of combinations and sequences of some fundamental operations'; and thus it is not as serious a defect of the section as it might at first appear that the examples of business applications considered are confined to accounting applications in insurance, public utility billing and payroll, and a single example each of inventory control and production scheduling. However, a larger and more varied range of business applications would have been valuable, and it is to be regretted that in this respect the volume may disappoint expectations.

COMPUTER DESIGN

The longest section in the book is that on the 'Design of Digital Computers,' which includes descriptions of ancillary equipment. The subject is treated thoroughly, with chapters on basic circuits, transistor circuits and logical design. There is a similar section on the 'Design and Application of Analog Computers.'

Indispensable, but not exhaustive. The book was prepared in the United States, and consequently the references to British equipment and systems are very sparse; but the production of this handbook is nevertheless an undertaking of the utmost importance and probably nowhere else is there to be found a treatment of the subject of computing and data processing at once as comprehensive and as compact.

INTEGRATED SYSTEMS FOR BUSINESS

The second book under review is written, as its title implies, specifically for business users of data processing machines. The first chapter defines 'the data processing problem' in terms of the recording, communication, storage and processing of information, and makes the point that 'it is usually unwise to concentrate on an *isolated* area of data processing' and advocates the 'systems approach' and 'integrated data processing.'

Subsequent chapters discuss filing, flowcharting, coding for programming, random access filing

systems, accounting and auditing. Though many businessmen may consider that detailed knowledge of the techniques of automatic data processing is for them superfluous and time-wasting, it is possibly more enlightened to feel that the vital processes in their businesses ought not to be carried on in a language that is totally incomprehensible to them. Knowledge of the symbols and patterns in common use in flow-charting is certainly valuable to people at every level of business management, if it is not imperative.

The notations and symbols used by programmers are now fairly well standardised, and they are described in the chapter on flowcharting. The design of data processing machines and the various techniques of coding are very fully described, including a chapter on 'machine-aided,' or automatic, programming.

Though it is outside the scope indicated by the title of the book, there is a useful chapter, entitled 'Steps in Planning and Programming Computer Applications,' which brings together in coherent form the various aspects of data processing that have been described in earlier chapters, and includes a brief but sensible discussion of systems analysis. It has been said many times before, but it is still probably true, that 'the effort required to develop a complete definition of the problem to be done is very often underestimated.' Emphasis is also rightly given to the necessity for the systems analyst to pay adequate attention to 'human relations problems' while carrying out his study.

The authors have designed their book particularly for the businessman without mathematical knowledge or skill, and they have added to its value by including, at the end of each chapter, a selection of test questions, so that the reader can use it as a systematic course of study.

Errol Wilmot

Courses and Lectures

18 January
Lecture on 'Some applications of Monte Carlo'
Organised by The British Computer Society
Venue: Manchester College of Science and Technology, Sackville Street, Manchester
Enquiries to: Capt C. A. Cox, Honorary Secretary, The British Computer Society, Industrial Administration Department, Manchester College of Science and Technology, Manchester 2

18-29 January
An introductory course on IBM machines (519, 513 and 514)
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1

19 January and on the 11 following Tuesdays at 6.30 pm.
A course on 'Electronic Data Processing'
Organised by Northampton College of Advanced Technology
Fee: £2.2.0
Venue: London
Enquiries to: Mathematics Department, Northampton College of Advanced Technology, St John Street, EC1.

20 January and 10 following afternoons at 2 pm.
'Electronic Computers and their Commercial Applications' an introductory course
Organised by Ealing Technical College
Venue: Ealing Technical College, St. Mary's Road, Ealing W5

20 January and on the nine following Wednesdays at 7 pm.
Lectures on 'Analogue Computers'
Organised by Southall Technical College
Fee: £1
Venue: Electrical Engineering Department, Southall Technical College
Enquiries to: The Electrical Engineering Department, Southall Technical College, Middlesex

20-21 January
Lectures on 'The Managerial and Engineering Aspects of Reliability and Maintenance of Computer Systems'
Organised by The Institution of Electrical Engineers (Measurement and Control Section) and the British Computer Society
Venue: Institution of Electrical Engineers, Savoy Place, London, WC2.

21-29 January
Course on the Sirius Computer
Organised by Ferranti Ltd
Fee: £24
Venue: 21 Portland Place, London, W1

21 January and the nine following Thursdays at 9.15 am.
Part II Course 'Electronic Computers and their Commercial Application'
Organised by Ealing Technical College
Venue: St Mary's Road, Ealing, London, W5

25-29 January
Course on IBM 077 Collator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

25 January and on the five following Mondays at 6.30 pm.
Courses on 'The Problems of Queueing and Flow'
Organised by Northampton College of Advanced Technology
Fee: £1.1.0
Venue: London
Enquiries to: Mathematics Department, Northampton College of Advanced Technology, St John Street, London, EC1.

25 January-5 February
Course on additional features to the IBM 650 computer
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

25 January-5 February
Course on the IBM 604 Calculator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

26-27 January
Executive Seminar (Applied Science)
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

26-29 January
A general appreciation course on computers
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

26 January and on the seven following Tuesdays at 6.30 pm.
Course on 'Programming of Computers with special reference to the Stantec Zebra Computer'
Organised by The Welsh College of Advanced Technology
Venue: Welsh College of Advanced Technology, Mathematics Department, Cathays Park, Cardiff.

27 January
Lecture on 'The Oral Presentation of Scientific Material'
Organised by The Institute of Electrical Engineers (Electronics and Communications Section)
Venue: Savoy Place, London, WC2.

27 January
Lecture on 'Storage Elements for Very High Speed Computers'
Organised by The British Computer Society
Venue: Northampton College of Advanced Technology, St John Street, London, EC1
Enquiries to: S A Tasker, Esq, Office Manager, The British Computer Society, Finsbury Court, Finsbury Pavement, London, EC2.

28 January
Lecture on 'Avoiding Mistakes by Oversight in an Industrial Programme'
Organised by The British Computer Society
Venue: Mathematical Institute, University of Liverpool
Enquiries to: A J Platt, Esq, Honorary Secretary, The British Computer Society, c/o Pilkington Brothers Ltd, St Helens, Lancs.

28 January
Materials Handling Management Seminar
Organised by British Institute of Management
Venue: London
Enquiries to: The Conference Secretary, BIM, 80 Fetter Lane, London, EC4.

28 January
Lectures on 'Fundamentals of Automatic Control and Process Dynamics'
Organised by Manchester College of Advanced Technology
Fee: £1.1.0
Venue: Manchester College of Advanced Technology
Enquiries to: The Registrar, Manchester College of Science and Technology, Manchester 1.

29 January
Lecture on 'Some Aspects of Design and Use of Beam-type Parametric Amplifiers'
Organised by The Institution of Electrical Engineers
Venue: Savoy Place, London, WC2.

1 February
Lecture on 'Problems involved in applying a Computer to Commercial Work'
Organised by The British Computer Society
Venue: Royal College of Science and Technology
Enquiries to: K D Henderson, Esq, Honorary Secretary, The British Computer Society, c/o J & P Coats Ltd, 155 St Vincent St, Glasgow C2.

1-5 February
Introductory course to the IBM 088 Collator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

1-9 February
Course on the IBM 628 Calculator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

1-12 February
Instruction course to the IBM 421 Accounting Machine
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

1-12 February
Course on the IBM 7070 Tape linked to RAMAC
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

1 February—11 March
Course on 'Management Practice and the Systems Analyst'
Organised by Management Training (PE) Ltd
Fee: 185 guineas
Venue: 12 Grosvenor Place, London, SW1.

2 February
Lecture on 'Data Transmission in relation to Computers and Data Processing Systems'
Organised by The British Computer Society
Venue: University Computing Laboratory, 1 Kensington Terrace.
Enquiries to: W F Mason, Honorary Secretary, c/o National Coal Board, GPO Box 10, Cathedral Buildings, Dean Street, Newcastle-upon-Tyne 1.

2 February
Lecture on 'Computer Techniques for Recording and Referring to Data'
Organised by The British Computer Society
Venue: Constantine Technical College, Borough Road, Middlesbrough
Enquiries to: W A Greig, Esq, Honorary Secretary, The British Computer Society, Constantine Technical College, Borough Road, Middlesbrough, Yorks.

8-12 February
Executive course on Data Processing Systems
Organised by Leo Computers Ltd
Fee: 25 guineas
Venue: London
Enquiries to: Leo Computers Ltd, Elms House, Brook Green, London, W6.

8-19 February
Course on the IBM 421 Accounting Machine.
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

9 February
Lecture on 'Production Planning by Computer'
Organised by The British Computer Society
Venue: Manchester College of Science and Technology, Sackville Street, Manchester
Enquiries to: Capt C A Cox, Honorary Secretary, The British Computer Society, Industrial Administration Department, Manchester College of Science and Technology, Manchester 2.

10 February
Lecture on 'Models of Stock Control and Production Scheduling'
Organised by The British Computer Society
Venue: Large Theatre, Electrical Engineering Department, The University, Edgbaston, Birmingham

Enquiries to: G. C. Lavaletter, Esq., 10 Cottage Lane, Marlbook, Bromsgrove Worcs.

10 February
Talk on ERNIE 'Random number indicator' — as used with Premium Savings Bonds
Organised by The British Computer Society
Venue: Hull Chamber of Commerce, Samman House, Bowlalley Lane, Hull
Enquiries to: J. Gemmell, Esq., 15 Stanhope Ave, Holderness Road, Hull.

10-11 February
A Supervisors' Seminar
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

11 February
Talk on 'The Computer in a University'
Organised by The British Computer Society
Venue: 29 University Square, Belfast
Enquiries to: R. Cordner, Esq., 25 Houston Drive, Belfast.

11 February
Talk on 'Initial Experience with a National-Elliott 405'
Organised by The British Computer Society
Venue: University Computing Laboratory, Eldon Hall, Woodhouse Lane, Leeds
Enquiries to: Dr. A. S. Douglas, Electronic Computing Laboratory, The University, Leeds 2.

11 February
Operational Research Seminar
Organised by British Institute of Management
Venue: Management House, 80 Fetter Lane, London, EC4
Enquiries to: The Conference Secretary, BIM, 80 Fetter Lane, London, EC4.

15-16 February
Course on the IBM 519 Document Originating Machine
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

15-26 February
Instruction Course for the IBM 420 Accounting Machine
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

15-26 February
Course on the IBM 604 Calculator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

15-26 February
Course on the Pegasus Computer
Organised by Ferranti Ltd
Fee: £30
Venue: Ferranti Ltd, Portland Place, London, W1.

15-19 February
Introductory Course to the IBM 088 Collator
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

17-19 February
Course on 'Punched Card Introduction to Computers'
Organised by IBM (United Kingdom) Ltd
Venue: Wigmore Street, London, W1.

18 February
Lecture on 'The Development of the Use of a Computer for Production Control'
Organised by The British Computer Society
Venue: Northampton College of Advanced Technology, St John Street, London, EC1.
Enquiries to: S. A. Tasker, Esq., Office Manager, The British Computer Society Ltd, Finsbury Court, Finsbury Pavement, London, EC2.

CONFERENCES

11 March
One-day Conference on 'Statistical Methods in Plant Control'
Organised by the Bristol College of Technology
Fee: £2.2.0
Venue: Bristol College of Technology, Ashley Down, Bristol 7.

4-8 July
Annual Conference at the Sun Pavilion, Cornwall Road, Harrogate, of The British Computer Society.

5-9 September
Second International Conference on Operational Research in Aix-en-Provence, France.
Organised by International Federation of Operational Research Societies.

UNIVERSITY COURSES

Birkbeck College, University of London.
The College's Department of Numerical Automation run lectures in the field of automatic digital computer design and use, which are held on Tuesdays and Wednesdays during the academic year. They are suitable for graduates qualified to read for the Academic Postgraduate Diploma in Numerical Analysis of the University of London. Space permitting, people with other approved qualifications may be admitted to the course.

The Mathematical Laboratory, University of Cambridge.
The Laboratory organises a Diploma course which lasts one academic year (October to June). This covers numerical analysis, programming and logical design. An examination is held in these three subjects and in addition students are required to submit a dissertation. (This is usually an account of a problem run on Edsac 2.)

Two lecture courses are held on numerical analysis (introductory and advanced), and, additionally, courses are held on the solution of partial differential equations and matrix methods.

Students admitted to the course are normally required to have reached the standard of an honours degree with sufficient knowledge of mathematics to profit from the courses in numerical analysis. In exceptional cases, this requirement might be waived.

MANUFACTURERS' COURSES

In addition to the manufacturers' courses listed above there are a number of courses which are held on an *ad hoc* basis, according to the demand for them.

English Electric offer a number of such courses: four-week programming course for Deuce, which costs £40, both for scientists and engineers and for business executives, and two-day Deuce appreciation courses, again for scientists and business executives.

IBM (United Kingdom) Ltd arrange courses for scientists on demand. They are prepared to organise courses on the following machines: the 610, 650 Scientific, 704 Scientific, and the 707 Scientific.

This Easy Money Could Help British Industry

Keith Bean

Two authoritative committees report this month on the advisability of a decimal currency for Britain. How would its introduction affect commerce and, in particular, data processing machines?

A GRAND debate about money will begin next month. It will gain in liveliness and public participation because it is of interest to everybody in the country, everybody from big business—finance, industry and commerce—through to the housewife, the junior book-keeper and even the schoolboy wrestling with his sums. And of course it will have special significance for all who use or make machines for processing money data.

The debate will be triggered off by the publication—expected about the end of this month—of a joint report from two authoritative committees which have been studying the practicability of adopting a decimal currency since 1958.

They are the Metric Committee of the British Association for the Advancement of Science and a special committee of the Association of British Chambers of Commerce. The first has members from some of our biggest manufacturers—ICI, Rolls-Royce, Short Brothers and Harland, Associated Pressure Vessels, Lever Brothers and Arthur Guinness—and the other represents the nation's traders.

AUTHORITATIVE TESTIMONY

Here are no amateurs weaving airy theories but solid men of affairs, and their views should carry a lot of weight. They have, moreover, sifted an enormous amount of testimony, gathered both directly and by questionnaire, from the highest authorities in banking and business generally.

Briefly, the evidence shows a widespread acceptance of the case for decimalisation in principle although, it is admitted, some of its supporters have not yet gone into the subject very deeply. Top banking people in the City say that they foresee that not many years hence Britain and a few of her overseas territories may be the only people in the world using the £sd system as we now know it. They are not sure that this would do Britain any really serious harm in international trade and finance but they are quite definite that it would do no good.

ACCOUNTS WITHOUT HEADACHES

Decimal currency is the easy way with money, so easy that the housewife can keep pace with the grocer's rapid calculation on the outside wrapping of her half-pound of bacon. It takes the headaches out of accounts and ledger keeping and out of Junior's school sums, like 144 times 1s 7¾d. And of course it makes for more economical business methods.

Most of the world accepted these advantages as decisive long ago. Indeed, of 231 currencies the bankers quote, there are only 30 which are not decimal or becoming decimal and even in some of these 30 territories there are strong pressures for the change to the 10-by-10 system.

COMMONWEALTH GOING DECIMAL

Apart from Canada, Ceylon, Malaya and our Far East possessions which have long had the system, more and more areas of the Commonwealth are 'going decimal.'

India began its change-over in 1957 with a target for completion in three years—rupees dividing into a hundred naipaisa (literally, new paisa). South Africa has announced that it will change over

'The biggest cost of a change to decimal money would be in converting or replacing machines which deal with cash. There are about half a million cash registers in Britain . . .'

in February 1961. A New Zealand government committee has recommended the change, and since the present Attorney-General, Mr H G R Mason, sponsored two decimal coinage bills while in opposition, the recommendations will certainly have a strong advocate in the cabinet.

Australia has appointed a committee to investigate decimal coinage, and there is a pressure group in the Federation of Rhodesia and Nyasaland strongly urging it. The Rhodesian advocates have been strengthened in their hopes by the decision in neighbouring South Africa, which has also made a change-over almost inevitable in the High Commission territories of Basutoland, Bechuanaland Protectorate and Swaziland.

The only exceptions apart from Britain are Pakistan and Ghana and some of the colonies, though in many of the territories (the West Indies, for instance) pounds, shillings and pence are still accepted alongside the decimal money.

Britain, goodness knows, has been ruminating on the subject long enough. Interest in decimalising the coinage began at least a century before the young United States implemented the idea in 1786. France led its application in Europe and by 1900 Russia, Germany, Latin America, Japan, indeed nearly every important nation, had followed the example. Britain had three Royal Commissions.

SAMPLES FROM THE MINT

The Royal Mint did produce sample coins, still preserved, which read: 'One ducat—sixpence,' 'half farthing—one centime,' 'five farthings—ten centimes,' 'one decimal penny—tenth of a shilling' and so on. The only permanent result however was the florin (tenth of £) which was introduced in 1849 when interest in decimalisation was lively and as a possible move towards it.

The first two Royal Commissions, appointed in 1838 and 1843 to consider the restoration of standards of weights and measures after fire destroyed the Houses of Parliament, both reported in favour of a system in which the £ would be divided into 1,000 parts. But the third, appointed in 1856, decided that although decimalisation had a balance of advantage for paper calculations, the existing system was better for shopping and for mental calculations generally!

Well, Britain was the world's dominant trading community and could go its own way. The same mood apparently governed the majority in the fourth and most recent Royal Commission, appointed in 1918.

A minority favoured the division of the £ into a thousand 'mils' and another minority wanted a system in which the halfpenny would be one cent. But the majority was against any change. The £ should be retained in any decimal system, it said, and the £-and-mil scheme was the only strongly supported system which complied with that, but it added:

'The advantage to be gained by a change to the £-and-mil scheme as regards keeping accounts is in no way commensurate with the loss of the convenience of the existing system for other purposes' and 'grave difficulties will be created by any alteration of the penny.'

TEN PENNIES TO THE SHILLING?

The 'convenience of the existing system' is at the core of the discussion we can expect in the months ahead, but the 'grave difficulties' in altering the penny have at least been greatly reduced by the very much diminished purchasing power of the penny. One simple answer was given years ago by the Decimal Association, and it is supported as a possible solution in the latest annual report of the Royal Mint. Simply revalue the penny upward by 20 percent, the Association said, and call it a tenth instead of a twelfth of a shilling.

South Africa is facing such an inflation of the copper with equanimity. It will keep such slot machines as take pennies. But here again usage demonstrates that the revaluation is not a great matter, for the threepenny piece, the tickey, is the common small coin for phone calls, newspapers and many other things—and there is no inflation here since it will still be a quarter of a shilling or two and a half cents.

Most people in Britain who have thought about it consider that decimal currency would be good for the country, but they argue about the cost of the change-over and about the sort of decimal system that might be adopted.

There are many ways of doing it. If you call a halfpenny a cent, you get a dollar of 4s 2d which they have in the West Indies—or you can call it by a new name, a royal, perhaps.

You can take a shilling and break it into a hundred cents, as they do in British East Africa

You can take £1 and break it into a thousand parts or mils (roughly a farthing each) as they do in Cyprus and Queen Salote's Tonga islands.

You can break £1 into ten florins and divide the florins into a hundred cents (again, of course, roughly a farthing).

Or, as South Africa is doing, you can create a new unit of ten shillings (to be called a rand in South Africa) and break that down into cents, although that has the disadvantage that your smallest unit, one cent, is more than a penny.

SOME OBJECTIONS

Apart from sentiment and ideas about the prestige of the cumbersome old £sd system, the main arguments against having decimal money are the dislocation the change-over would cause while it is taking place, and the cost of it.

There would be big savings after the change. One of our biggest catering firms says that it already saves thousands of pounds a year by doing its costing in decimals, for instance. It further exploits decimals, incidentally, by taking a unit not of a dozen or a gross but 100 items. But the initial cost of the change-over is a problem.

The cost of minting the new coins and printing the new notes is the least of it. The Royal Mint is continuously producing new money. Whether for instance, a coin is stamped one shilling or ten cents or 50 mils makes little odds.

The Mint thinking on the bronze coins is quite fluid. Mr J H James, Deputy Master and Comptroller, points out that no farthings have been struck since 1956.

'Farthings,' he says, 'may have finished their useful life, and their continued existence as legal currency is to many people a sporadic irritant. No coinage should have unnecessary denominations.

'A large body of opinion finds the penny much too clumsy for its diminished value. The risk of confusion with the halfpenny rules out a simple reduction in size, unless the halfpenny itself were first replaced by a smaller piece. However, if the farthing were out of circulation the way would be clear for debate on a smaller halfpenny and hence on a smaller penny.'

INCREASED DEMAND FOR HALFPENNIES

He adds that while farthings have virtually disappeared and the demand for pennies and threepences is falling, demand for halfpennies has more than doubled in the last five years. In conjunction with the large demand for sixpences, this trend follows the pattern of the coinage of the United States mints, in which dimes and one-cent pieces greatly predominate.

Thus the smaller coins have already changed both in absolute and in comparative value and usage, and they are ripe for change in size. In such a fluid situation there would appear to be no great barriers to taking at least one step toward decimalisation by splitting the shilling into tenths instead of twelfths.

'Manufacturers of data processing equipment would undoubtedly benefit from a general acceptance of the decimal system.'

COST OF REPLACING MACHINES

The biggest cost of a change to decimal money would be in converting or replacing machines which deal with cash. It is apparent that slot machines are only a problem if the size of the coins is changed. But there are about half a million cash registers in Britain, not to mention all the tabulating and calculating machines.

Many big firms replace their calculators and tabulators long before they are worn out, simply because new and better ones are developed. Conversion here would not seem to be difficult. But the small man is different.

Many cash registers are genuine antiques, up to 50 years old. They are still working but they are too ancient to convert.

Nationally speaking, a rough estimate of the cost of the change to decimal money would be £150 millions. It could and should, from the accountancy point of view, be spread over some years, and the Government could help with grants. But the trader would still presumably have to find some money, which might be a resented burden for the small man.

TO SOFTEN THE IMPACT

Another suggested way to soften the impact of the change would be to give good advance notice, say 10 years. Then all the new machines in that period could be so made that they would be easily convertible when change-over day came along.

The makers of the machines for the United Kingdom home market after decimalisation would presumably face keener competition from imports from decimal countries, though that is probably a factor of decreasing importance, in view of the tariff-cutting programme of EFTA (the European Free Trade Association, the outer seven).

Mechanical machines would require changes such as the number of teeth on a ratchet wheel and the gearing between two indicators. An English adding machine has a 20:1 gear (a Geneva move-

ment, really) for shillings and a 12:1 gear for pence. Decimalisation would eliminate the need for them.

EFFECT ON COMPUTERS

With computers and other machines which can be programmed there is little or no complication. Under the present system, the order can be framed in the program to convert £sd to decimals at the beginning and to convert back to £sd at the final stage. Such program steps would be unnecessary with a decimal coinage.

An IBM United Kingdom spokesman summed up:

'Manufacturers of data processing equipment would undoubtedly benefit from a general acceptance of the decimal system, since the addition of sterling features for machines operating in the sterling area could be dispensed with. All these machines are basically decimal and although our company makes no extra charge for machines sold in the sterling area there are obviously complications in the engineering required.

'There is disagreement even between sterling countries on the coding of 10d and 11d. In some cases these are read by an 11 or 12 punch. In some cases zero is punched for 10d, and zeros, as such, are not punched. This means that the double punch blank column detection device on many machines is wasted.

'Sterling counters on accounting machines are relay counters which can be switched for decimal or sterling. These are more expensive than ordinary counters and when used for sterling a part of their capacity is lost. This would not occur under a decimal system.

'In all machines punched cards are normally fed 9-edge first so that the numbers are read in the sequence 9 through 0, and only then can 10d and 11d be read—a sequence that is scarcely logical and often produces complications in timing.

'There is little doubt that both for electronic data processing systems and electric accounting machines, with or without electronic devices, there could be no argument in favour of retaining the present system of 12.'

LETTER TO THE EDITOR

Numerical Control of Machine Tools

The Editor,
AUTOMATIC DATA PROCESSING.
Sir:

In your October 1959 issue you print an article by the Research Department of John Diebold and Associates of New York entitled 'Numerical Control of Machine Tools.' There are a few points on which I should like to comment.

In the British and European markets military efforts have not predominated to the same extent as in the United States, and where machines have been bought for military purposes the purchase has usually been a straight commercial one, without the favourable terms which were current in the United States. Furthermore, British controlled machines have in general been much smaller than American ones and certainly less specialised; consequently they have been more readily usable in industry as a whole.

The definition of analogue control systems I feel is not clear, and could be read carelessly in such a way as to cast doubts on systems using analogue feedback and interpolation methods. What appears to be meant is that digital inputs, in the sense of a numerical description, in some form, of the path to be followed, is essential but that the internal computation and feedback may be either analogue or digital.

The chart on pages 18 and 19 is not sufficiently explained. It seems a reasonable assumption however that the five systems portrayed are, in order, Giddings and Lewis, Bendix, Cincinnati, ECS and Ferranti. If this is the case it is worth pointing out that the Cincinnati systems, and the EMI system which is the original of the Cincinnati, are quite capable of proceeding direct from the translation stage to the director input without a computer; the majority of EMI machines in use are in fact operating in this way.

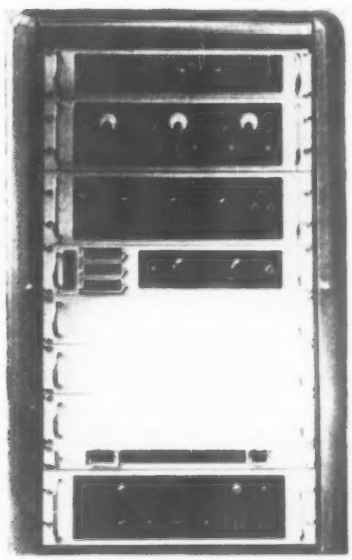
In this connection the statement that it is nearly mandatory that the *chordal* data for curved parts be prepared on a computer for the Cincinnati system is misleading, since the Cincinnati (and EMI) systems use a parabolic, not a chordal, approximation and thirty-two points are sufficient to define a 5-inch diameter circle to within 0.0001 inch. Far from 'one system having recently programmed a test piece using only a Marchant calculator in addition to a director,' many thousands of piece parts have been manufactured using only a calculator of this sort before entry into a director immediately coupled to the machine tool and costing about the same amount as the controls needing an external director.

R. H. BOOTH,
EMI Electronics Ltd.,
Hayes,
Middlesex.

28 December, 1959

Sampling 288 Channels

DESIGNED to record multi-channel strain gauge or thermocouple outputs, the Multi-Channel Digital Millivolt Recorder will give a full scale decimal digital output for inputs ranging from 15 to 50 millivolts. The equipment can automatically sample 288 channels in turn. The output can be recorded on a Creed tapepunch or on an IBM electric typewriter. Also, single outputs may be fed to an illuminated numerical display.



The digital output can be recorded on an electric typewriter or a teleprinter machine

The equipment is rack mounted in a substantial cabinet three feet six inches high. The rack contains the display unit, channel selectors, digitiser chassis, control unit, output unit, and the power unit.

Manufactured by Bristol Aircraft Ltd, the equipment is being distributed by Southern Instruments.

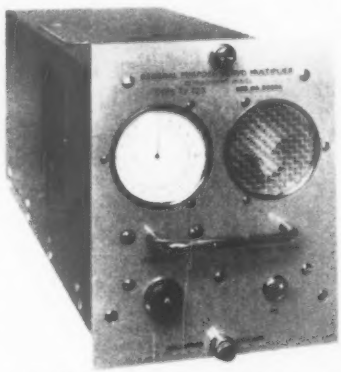
Southern Instruments Ltd,
Frimley Road,
Camberley,
Surrey.

Wideband Servo-Multiplier

A NEW, low inertia servo-multiplier (described as Type TJ 725) has been announced by Solartron. It will operate with less than one degree phase lag at full-scale amplitude up to 10 cycles per second. It permits multiplication of up to five analogue variables by one other variable, or the generation of up to the sixth power of one variable.

Standard in this equipment is a six-section potentiometer—one section having additional taps for the connection of loading resistors to achieve special functions of a variable.

This non-linear computing unit is self-contained and incorporates efficient transistorised power supplies. Hence, the unit can either be incorporated into an existing analogue installation or operated independently.



A self-contained unit it can also be linked with others

The Solartron Electronic Group Ltd.
45 Thames Street,
Kingston,
Surrey.

Analogue Computing Units

BRUCE PEEBLES are now offering a range of low-priced analogue computing units from which special-purpose analogue installations can be built. The units—there are 11—comprise an operational amplifier, a simplified operational amplifier, a sine-square wave generator, an initial conditions unit, a noise generator, a non-linearity unit, an armature supply unit, a power amplifier, a phase-sensitive detector, a drift stabilised amplifier, and a scale unit for use with the drift stabilised amplifier.

Bruce Peebles and Co Ltd,
Electronics Department,
Edinburgh, 5.

For Invoicing?

IF mechanised billing is not for you, and you insist on pinning your faith to typed invoices, you may be in the market for this standard office typewriter—designated as the Style model. Manufactured in France by the Société de Mécanographie Japy, it is being marketed in Britain by the French company's British subsidiary.

Business Machines Japy Ltd.,
Colston House,
Derby Road,
Nottingham.

Exhibits at the Physical Society Exhibition

—see page 45

TO BE *well informed on the latest developments* **in data processing**

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ADP 1

Between 18 and 22 January the forty-fourth Physical Society Exhibition will be held at the Old Horticultural Hall, London. Below, a brief foretaste of some of the equipment that will be on show is given:

Cambridge Instrument Company hope to show a precision four-dial potentiometer. This instrument is designed to give better discrimination in precise electrical d.c. measurements. It will give readings in steps of 0.1 muV up to 2V on a single range and is in the form of a double potentiometer. The primary section has two dials giving 20 steps of 0.1 V and 100 of 0.001 V respectively, and a secondary section has a further two dials giving 100 steps of 10 muV and 100 steps of 0.1 muV respectively.

Current setting controls are provided together with a circuit selector suitable for three test circuits.

The Department of Scientific and Industrial Research will have a stand where digital circuits using 150 c/s Ramey Magnetic Amplifiers will be on show. These half cycle response magnetic amplifiers can be used in the construction of logical elements and bistable flip-flops. They are cascaded into delay lines, pulse repetition rate counters and pattern generators.

EMI Electronics will be exhibiting a television camera tube with a 'memory,' capable of storing a picture for several seconds after an object has passed out of view. A special vidicon pick-up tube has been developed to enable transients to be studied in more detail than would be possible using conventional means. This tube has a specially prepared photo-conductive surface with integrating and storage properties. Tubes of this kind might be used for systems conversion, for example, to present a radar picture as a bright stationary television display. The company will also display peripheral equipment to be used with their Emidec digital computers.

Ferranti will have on show magnetic drums, digital voltmeters, silicon semi-conductor devices, cathode-ray tubes and transistor inverters. Intended for long term creep testing at high temperatures is a recording extensometer, developed by Ferranti in conjunction with the Aeronautical Directorate Laboratories, which will also be exhibited.

Hilger and Watts will display a wide range of instruments for measuring not merely physical quantities like temperatures and pressures but qualitative characteristics such as surface finishes or surface colours. Also the company will demonstrate a range of data processing and data logging equipment, such as high-speed resolution digitisers, and more conventional equipment such as printers and typewriters specially developed for data logging.

J Langham Thompson will exhibit new transducers for the measurement of acceleration, displacement, force, pressure and vibration; also a number of new electronic measuring instruments for use with strain gauge and inductive transducers—these latter are designed on a modular principle and are completely transistorised.

Venner Electronics will be showing a range of transistorised timing, counting and frequency measuring equipment.

INDEX TO ADVERTISERS

[illegible] 5

[illegible] 45

[illegible] [illegible]

[illegible] 44

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★ *Just Published* ★

Handbook of AUTOMATION COMPUTATION and CONTROL

Volume Two: Computers & Data Processing

Edited by

E. M. GRABBE; S. RAMO
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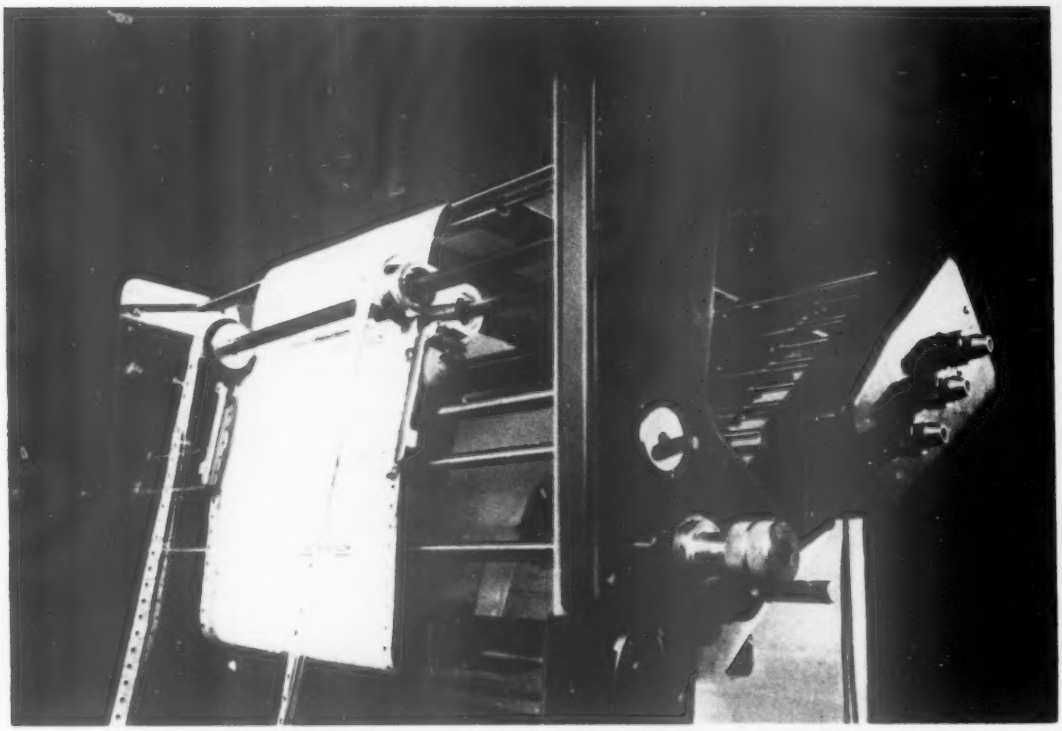

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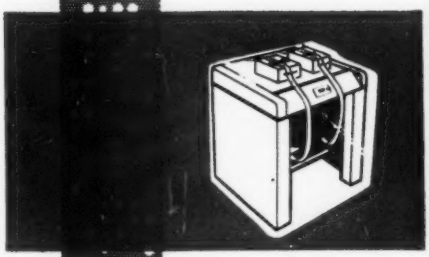

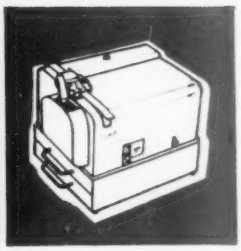

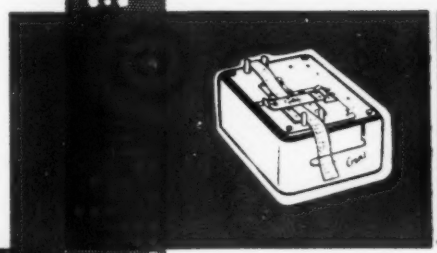

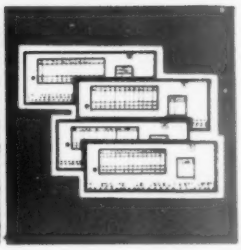

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